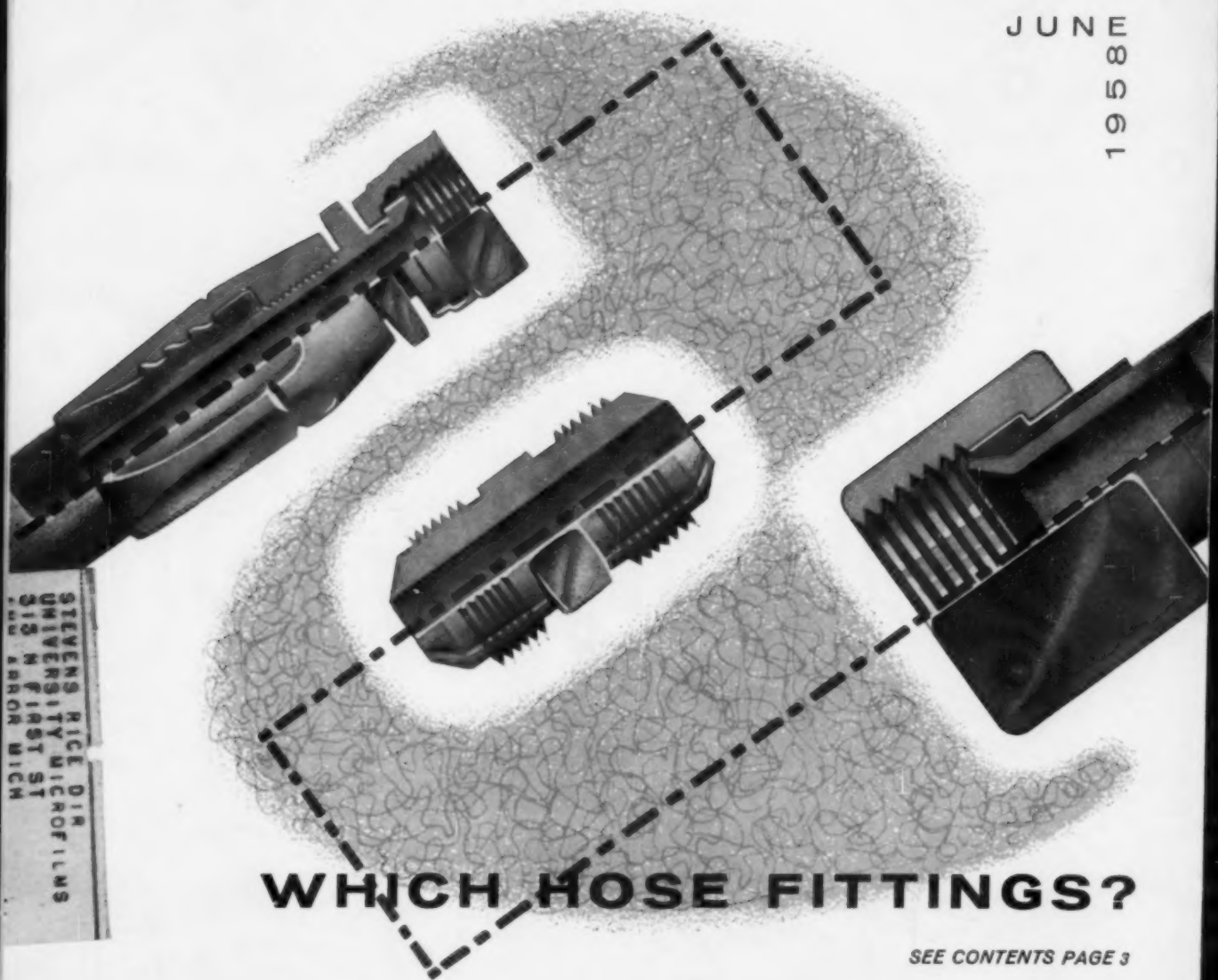
Applied Hydraulics

PNEUMATICS · ELECTRICAL CONTROLS

JUNE 1958



STEVENS INST OF TECH
CASTLE POINT STATION
HOBOKEN N J

WHICH HOSE FITTINGS?

SEE CONTENTS PAGE 3

THE MAGAZINE OF FLUID POWER

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

1958 Fluid Power Contest
CLOSES JULY 1st
For Complete Information, See Page 48

shuts off both sides of line... prevents loss of liquid, gas, or pressure.
Available in brass or steel with female pipe thread connections from ⅛" to 1"
FOR PRESSURE OR VACUUM SERVICE

HANSEN

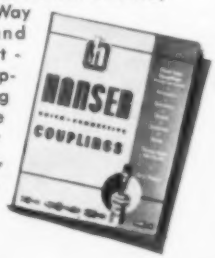
QUICK-CONNECTIVE TWO-WAY SHUT-OFF COUPLINGS

Both ends of line are positively sealed when you disconnect a Hansen Series HK Two-Way Shut-Off Coupling. To connect, just pull back sleeve and push Plug into Socket. To disconnect, merely pull back sleeve. No tools required. Identical valves in Socket and Plug permit free flow of gas or liquid when Coupling is connected—practically eliminate spilling of liquid or escape of gas when disconnected.

REPRESENTATIVES IN PRINCIPAL CITIES

WRITE FOR THE HANSEN CATALOG

Here's an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings—including Special Service Couplings for Steam, Oxygen, Acetylene, etc.



SINCE 1915 — QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 35, OHIO

CIRCLE 54 ON READER SERVICE CARD

NEW HYDRAULIC FLOW CONTROL VALVE

Calibrated for Precision Control

3/8" VALVE
Actual Size
$16.00

HANNA *Flo-Set 1000* VALVES

are used for controlling flow of petroleum liquids, water and synthetic hydraulic fluids.
Pressure to 1000 psi.
Sizes ¼", ⅜", ½" and ¾"
Temperatures –40° F to +250° F

To meet the demands for precision control of hydraulically powered equipment, Hanna offers this new calibrated speed control valve. Flow can be accurately regulated from zero to desired rate by turning the adjusting sleeve. Once set to the desired flow rate the valve can be "locked". Calibrations assist in setting the valve to pre-determined flow rates.

The new Flo-Set 1000 Valves are the result of over 50 years of Hanna design and manufacturing experience in the field of fluid power. They are built to close tolerances with quality materials and like all Hanna products they are offered only after extensive laboratory testing and field experience. Their performance is guaranteed for the service specified.

Ask your Hanna Representative listed in your classified directory and Thomas' Register for complete information—or write us for details.

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES

1741 Elston Avenue Chicago 22, Illinois

want *Any Rubber Problems Solved?* ask *A Member of the M-R Family*

for parts of silicone rubber...

Silcone Division explores the frontiers, where new demands are being made for flexibility and durability at extreme temperatures. New Silicone compounds with greater oil resistance, strength and electrical properties are increasingly valuable to today's industry. With seven years of experience in the injection molding and extrusion of silicone, Silicone Division can assure high product uniformity and close-tolerance manufacture.

for color in rubber...

Rainbow Division works in the vast and expanding field of color. Whether it's to brighten a housewife's new kitchen or to identify an industrial rubber part. Rainbow Rubber combines bright, durable color with dependability and toughness. If your product requires a colorful rubber, Rainbow Rubber can help you.

for versatility in rubber...

Plastics and Latex Division specializes in the dipping and forming of a wide variety of articles. Working in the field of polyvinyl chlorides, they have developed new techniques which solve dipping and coating problems more easily, more effectively and more economically. In this field, too, the Minnesota Rubber family of companies gives the finest and most effective service.

Write for the 16-page brochure describing Minnesota Rubber's facilities, also for full information about how Minnesota Rubber can help solve your production problems. Address 3630 Wooddale Ave., Minneapolis 16, Minn. Minnesota Rubber Company—originators of modern rubber injection molding and PROTOTYPES by KOTOKAST.

MINNESOTA RUBBER COMPANY • 3630 Wooddale Avenue
Minneapolis 16, Minnesota • Department 102

for color in rubber
for parts of silicone rubber
for versatility in rubber
for applied product development

MINNESOTA MR RUBBER

Rainbow Rubber Division
Silicone Rubber Division
Plastics and Latex Division
Research and Development Division

CIRCLE 79 ON READER SERVICE CARD

Applied Hydraulics

VOLUME 11/NUMBER 6

JUNE 1958 THE MAGAZINE OF FLUID POWER

CIRCUIT ANALYSIS

SELECTING A DRIVE FOR LOW SPEED ACTUATORS 65
By Willard Spencer

VARIABLE VOLUME AT LOWER COST 72
By Larry Strosser and John Sharp

USE A FULL HYDRAULIC SERVO FOR EDGE CONTROL 76

PRESSURE CYCLING CIRCUITS 82
By J. R. Fawcett

PNEUMATICS

HOW TO STOP AIR CYLINDERS SMOOTHLY 74
By Elmer F. Heiser

AIR CYLINDERS MAKE PRESS DOUBLE ACTING 84
By Bert Kepple and Ralph Williams

THREE AIR CIRCUITS 94

FAIL-SAFE ELECTRIC CONTROL FOR AIR-POWERED CUTTER 96

AIR CUTS COSTS ON TOOL FEED CIRCUIT 98
By R. S. Brosius

PRODUCT APPLICATION

CONTROLLED TURNING PUTS SCREEN ON TV 67
By E. K. Kaucher

WHICH HOSE FITTING? 68
By Jerry Taborek

MOTORIZED RELIEF VALVE FOR REMOTE CONTROL 79
By Z. Fredrick and Jule Hulman

MOBILE EQUIPMENT

UNDERWATER FLUID MOTOR POWERS DREDGE CUTTER 86
By John H. Milne and Albert A. Miller

FINE POSITIONING WITH MODIFIED VALVES 92
Harold Isaacs

AVIATION SECTION

MANIFOLDED BOOSTERS IMPROVE RELIABILITY 102
By C. H. Cannon

TESTING ELECTROHYDRAULIC SERVO VALVES 106
By Kenneth S. Knapton, Jr.

DEPARTMENTS

9....Fluid Power Lines
10....Letters to the Editor
24....Future Events
26....Briefs
60....Useful Literature
62....New Products
137....Post Scripts of Industry
142....Market Place
143....Advertisers' Index

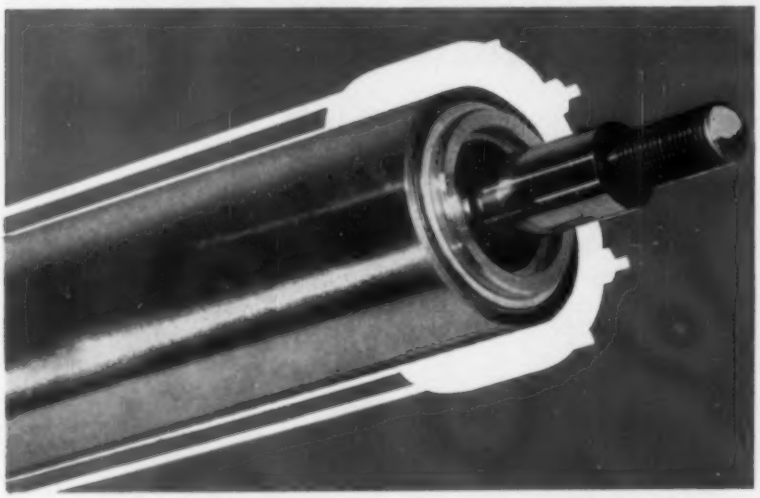
FCI FRANCHISE CIRCULATION

DISTILLED WRITING

BPA

copyright 1958 by The Industrial Publishing Corporation

3000 PSI
OPERATING PRESSURE



UP TO 50% LESS SPACE, WEIGHT & COST

Sleek, powerful DECCTO Cylinders, with exclusive Bruning-ized "Black Mirror" bores, save space, weight and cost in any application. AVAILABLE in bore diameters from 1½" to 4", plus a "Pee Wee" series from ⅜" to 1¼"... with innumerable mounting configurations. NO tie rods, NO castings, NO bolts, NO screws! Disassembly or reassembly takes less than 30 seconds. Qualified and Specified as "Standard Original Equipment" on thousands of applications ranging from hypersensitive missile control systems to heavy duty industrial, automotive and military ordinance installations. DECCTO cylinders are competitively priced... with FAST DELIVERY!

DECCTO

for specifications, prices, test samples... contact—

B the *Bruning* COMPANY

P. O. BOX 147 LINCOLN NEBRASKA

LOOK TO BRUNING, also, for

QUICK DISCONNECT COUPLERS for industrial, agricultural, aircraft and missile applications . . . FUEL SYSTEM COMPONENTS for Aircraft and Missiles . . . plus DESIGN, DEVELOPMENT, and MANUFACTURE of CUSTOMER SPECIALS

GET FULL DETAILS TODAY . . . write

the BRUNING COMPANY P.O. Box 147 Lincoln, Nebr.

Send me information on .....

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

Applied Hydraulics

THE MAGAZINE OF FLUID POWER

Published monthly by
THE INDUSTRIAL
PUBLISHING CORP.
812 Huron Road, Cleveland 15, Ohio

IRVING B. HEXTER ..... President
LESTER P. AURBACH
..... Executive Vice-President
EDWIN M. JOSEPH ..... Vice-President
LEE HAAS ..... Vice-President

STAFF

PAUL ROLNICK
..... Editor and Publishing Director
ALLAN E. MORRIS
..... Executive Editor
KEITH A. CARLSON
..... Associate Editor
BERT BENKENDORF
..... Associate Editor
SCHOLER BANGS ..... Western Editor
Los Angeles Office
JOHN A. LANKESTER, A.R.Ae.S.
..... European Editor
SUSANN SLIVA ..... Editorial Assistant
ALARIC MAUSSER ..... Art Director
N. G. KISER ..... Circulation Director
ALAN KICHLER ..... General Mgr.
Franchised-Dealer Dept.
R. V. STARKS
..... Mgr. Reader Service Dept.

SALES OFFICES

CLEVELAND 15 ..... SUperior 1-9622
R. D. SHATTUCK

NEW YORK 17 ..... MUrray Hill 7-3420
LEE HAAS, Vice-President
V. R. STEIN, Administrative Assistant
RONALD ROSE, Eastern Representative
60 E. 42nd St.—Room 836

CHICAGO 11 ..... WHitehall 3-1655-56-57
CHARLES F. GEYER, Manager
S. R. TRACY
520 N. Michigan Ave.—Room 704

LOS ANGELES 57 ..... DUnkirk 7-5104
ALAN T. CAZIER, Manager
WILLIAM MILLS
Room 8, Granada Building
672 South Lafayette Park Place

LONDON S.W.1 ..... Victoria 2608
JOHN A. LANKESTER, A.R.Ae.S.
..... Manager
31 Palace St., Westminster

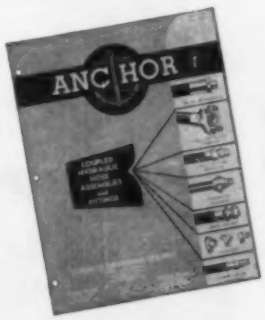
SUBSCRIPTION in United States and possessions—$5.00 per year; Canada—$6.00 per year; Foreign—$7.00 per year, except United Kingdom. United Kingdom subscription £ 3.00 per year, payable in Sterling to our London Office. Single copy price, this issue, $.50. All subscriptions subject to individual acceptance by the publisher.

AFFILIATED PUBLICATIONS: REFRIGERATION & AIR CONDITIONING BUSINESS, PRECISION METAL MOLDING, FLOW, INDUSTRY & WELDING, OCCUPATIONAL HAZARDS, MODERN OFFICE PROCEDURES, AERONAUTICAL PROCUREMENT, MATERIAL HANDLING ILLUSTRATED, and WELDING ILLUSTRATED. Member, Business Publications Audit of Circulation, Inc.

Accepted as controlled circulation publication at Pontiac, Illinois. Please return 3579 forms to 812 Huron Road, Cleveland 15, Ohio.

Useful Literature

Condensed Catalog Covers Anchor Line



Users and manufacturers of hydraulic equipment will find the Anchor Condensed Catalog No. 57-S a most valuable adjunct to their engineering or maintenance files.

It contains a condensed, yet very complete presentation of the Anchor Line of Hydraulic Hose Assemblies, Couplings and Fittings. The Anchor Line is so reviewed as to greatly simplify selection of the correct Hose Assembly, Coupling or Fitting for any given application.

Included in this catalog are descriptions of the most standard Anchor Products, including Anchor Ductile Sleeve Couplings and other permanently applied Couplings with 2-Wire Braid Hose for high pressures, and with 1-Wire Braid Hi-Burst 2-Rayon Braid, or Spiral Wire Braid for medium and low pressures.

Also described are Anchor Reusable Couplings which include the commercial Duloc Couplings for QW and QWR Hose and Anchor Standard Reusable Couplings with 2-Wire Braid Hose for high pressures, with 1-Wire Braid Hose, Hi-Burst and Standard 2-Rayon Braid Hose for medium and low pressures.

Anchor FLANCO 4-Bolt Split-Flange "O"-Ring Couplings and Clamp-Type Hose Couplings for quick, easy emergency repair are listed.

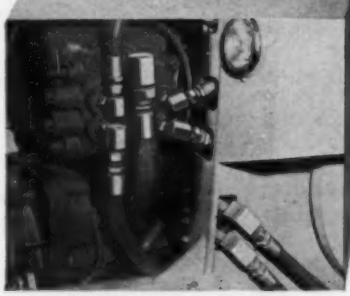
The right fitting to suit practically any piping situation can be found in the Anchor Line of Adapter Unions and Pipe Fittings with its wide range of sizes and thread combinations.

Also shown are the new Anchor SAE Adapters and Fittings designed to SAE Straight Thread "O"-Ring Boss standards, which are carried in stock.

This condensed catalog of Anchor standard stock products is now available on written request. Write Anchor Coupling Co. Inc., 350 North Fourth Street, Libertyville, Illinois, and ask for Catalog No. 57-S.

They're Tough—

and always found where the going is roughest!



We invite you to send us your specifications for recommendations.

ANCHOR®

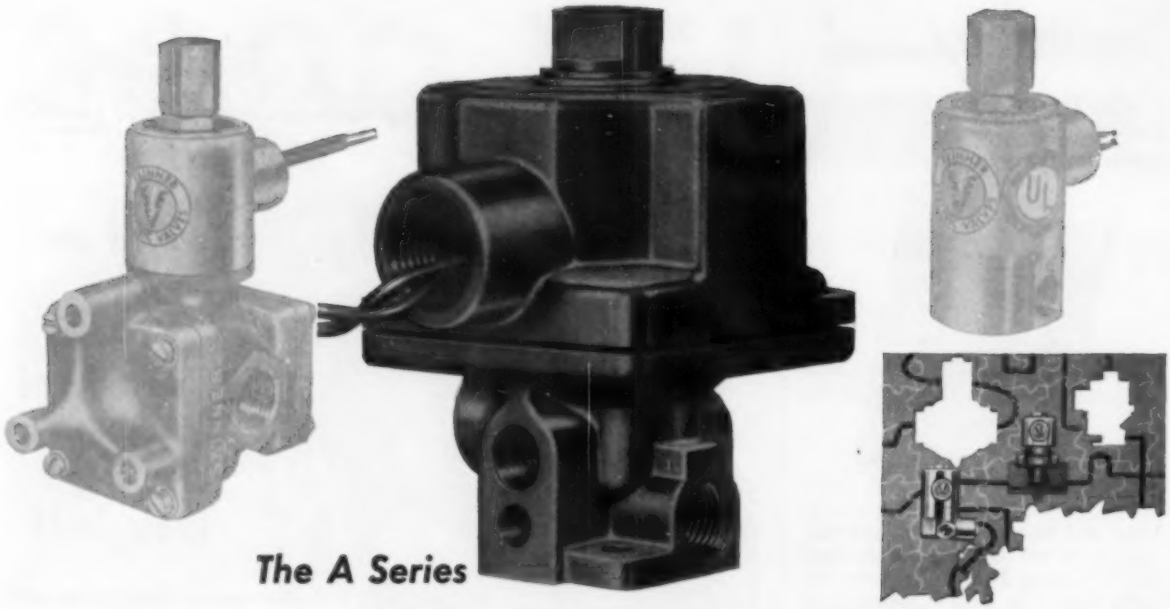
HYDRAULIC HOSE ASSEMBLIES AND FITTINGS

You mention the hydraulic application and we will recommend, out of our wide variety of styles and complete range of sizes, an Anchor assembly, or fitting, that exactly meets your requirements—and that will deliver a bonus margin of service life. This maze of assorted types of Anchor Hose Assemblies; shown on a Hough Model "HO", 4-Wheel Drive, Payloader Tractor Shovel—reflects the usage of Anchor Assemblies on all famous Hough Tractors. And again, this wide acceptance is repeated on practically all well-known heavy-duty hydraulic driven equipment used where continuous service under severest conditions is mandatory. Anchor Hydraulic Hose Assemblies, Couplings and Related Fittings have long been the preference of leaders, because they are designed to the need and produced under strictest supervision.

ANCHOR COUPLING CO. INC.

350 No. Fourth Street — Libertyville, Ill.
Branch Offices—Dallas, Texas—Plymouth, Michigan

CIRCLE 8 ON READER SERVICE CARD



The A Series

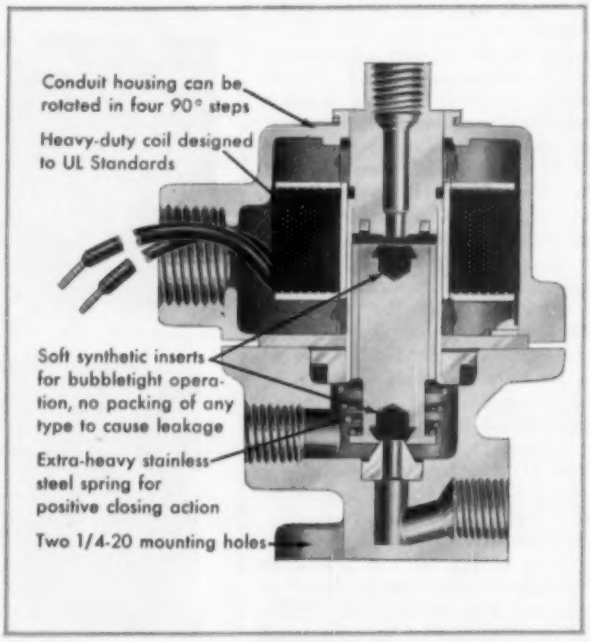
NEW— three-way Skinner Valve line for medium-size cylinders

This new A Series valve line bridges the gap between the famous V5 line used with small cylinders and the reliable M3 line used with large cylinders. The design of this new line permits economical and efficient operation of medium-size cylinders as well as faster operation of smaller cylinders where increased cycling speed is a necessity.

The first of the A Series line is a 3-way normally closed valve with a 5/32" orifice and 1/4" NPT ports, and a pressure rating of 125 PSI. It is designed for use with such media as oil, air and inert gases.

Despite the increase in capacity, this new valve is light in weight (only 3 pounds) and compact (3 7/8" high and 2 5/8" square). The body and mounting are non-corrosive zinc and the internal parts are stainless steel. The plunger is spring-loaded and direct-acting, and the valve can be mounted in any position. Soft synthetic inserts are used, assuring bubbletight operation and long, trouble-free life.

For additional information, options and specifications, call the Skinner Representative or Distributor nearest you — he's listed in the Yellow Pages. Or write us at the address below, Dept. 316.


Conduit housing can be rotated in four 90° steps
Heavy-duty coil designed to UL Standards
Soft synthetic inserts for bubbletight operation, no packing of any type to cause leakage
Extra-heavy stainless steel spring for positive closing action
Two 1/4-20 mounting holes

SKINNER ELECTRIC VALVES

THE CREST OF QUALITY

SKINNER ELECTRIC VALVE DIVISION

NEW BRITAIN CONNECTICUT

105 EDGEWOOD AVENUE

. . . Fluid Power news

REPORT NO. 12,102

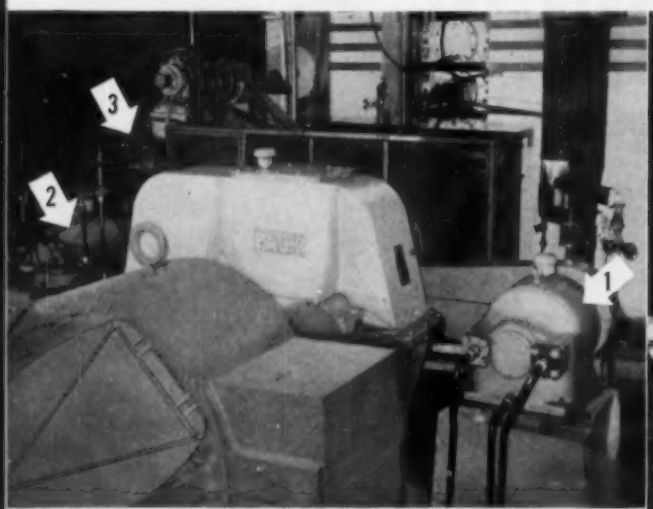
"ANY-SPEED" WINDER DRIVE CUTS COSTS

From Oilgear Application-Engineering Files

HOW OILGEAR "ANY-SPEED" WINDER DRIVE IMPROVED SUPER CALENDER PERFORMANCE AND PRODUCT QUALITY

CUSTOMER: *A Large Midwestern Paper Manufacturer*

DATA: This company had the same problem on a super calender that faces every manufacturer of a continuous sheet, strip or web that can be easily torn or broken . . . winder synchronization and tension control for top product and roll quality. *Specific job requirements*: 1: Use minimum of calender main electric drive power to prevent possibilty of overload. 2: Close tolerance "Any-Speed" synchronization between winder and calender to prevent loose winding at low speeds, "catch-up" and tearing at high speeds. 3: A minimum top operating speed of 1,000 ft/minute. 4: Dependable, trouble-free, round-the-clock performance. 5: Conserve valuable floor space. This application is a particular challenge, since other drive which provided a high top speed proved uncontrollable on starting take-off.



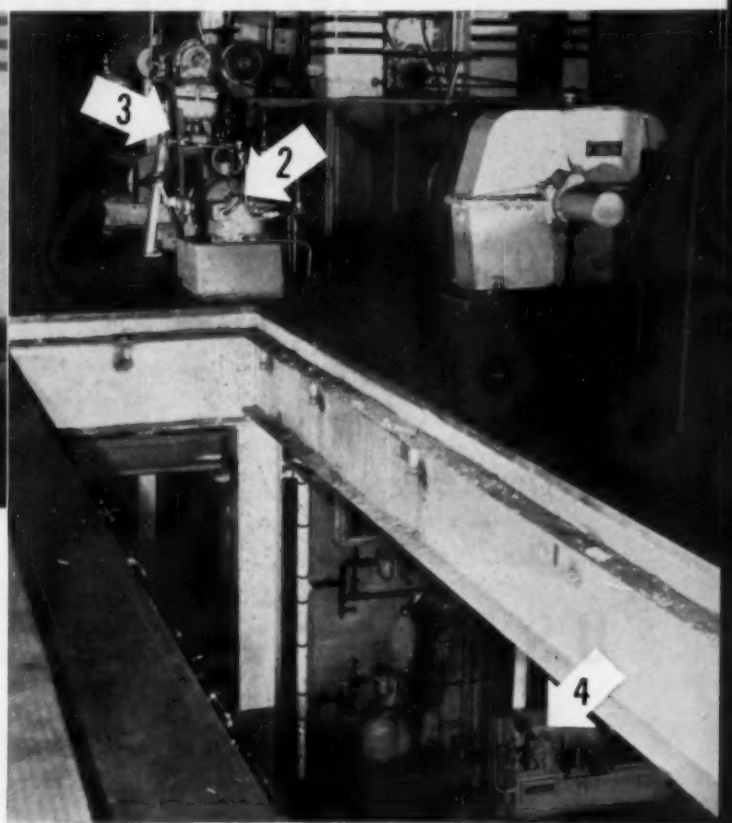
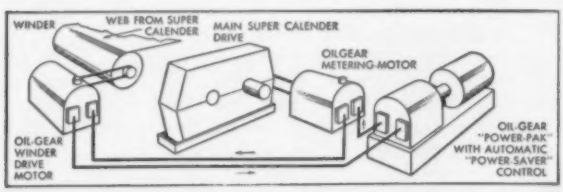


Photo upper left shows Oilgear metering-motor (1) to right, as connected with main calender drive. Winder-drive motor (2) and back panel for automatic, adjustable, winder-tension control (3) can be seen in background. Photo above shows Oilgear heavy-duty "Power-Pak" (4) installed in basement beneath super calender to conserve valuable floor space. Also shown are Oilgear winder-drive motor (2), and automatic, adjustable, winder-tension control panel (3).

SOLUTION: An Application-Engineered Oilgear "Any-Speed" Winder Drive System . . . an Oilgear heavy-duty "Power-Pak"; two series-connected, constant torque, fixed stroke, Oilgear Fluid Power motors; an Oilgear automatic, adjustable, winder tension valve. This installation easily surpassed all specified requirements, and has operated on a continuous 24-hour schedule for over 3 years with no reported major maintenance. User Reports — *this winder drive has assured consistent production of high-grade finishes, good roll quality, and reduced over-all cost of machine operation.* Due to constant, "Any-Speed" synchronization, and unvarying tension on the paper web in the super calender stacks, "break-fold" marks on soft calender rolls have been virtually eliminated — resulting in longer calender roll life. Costly roll refinishing and machine downtime are sharply reduced.



OPERATION: Oilgear Variable Displacement Pump with Automatic "Power-Saver" Control (4) supplies Fluid Power to metering-motor (1) — "tied" to main super calender drive. In this way, metering-motor (1) tends to boost main calender drive power rather than taking power from it. Starting a new roll, series-connected winder-motor (2) must run at high speed, requiring high volume at low torque (pressure). As roll diameter increases, proper web tension is maintained over a wide core-to-full-roll ratio by automatically increasing torque (pressure), and decreasing volume. Automatic web tension control is fully adjustable.

Whether you need constant or automatic tapering tension, constant or automatic tapering torque, or a combination of torque-tension characteristics . . . there's a dependable, Oilgear "Any-Speed" drive to meet your requirements.

Users in every industry claim — "for lowest-cost-per-year . . . it's Oilgear!"

For similar practical solutions to YOUR linear or rotary drive and control problems, call the factory-trained Oilgear Application-Engineer in your vicinity. Or write, stating your specific requirements, directly to . . .

THE OILGEAR COMPANY

Application-Engineered Controlled Motion Systems

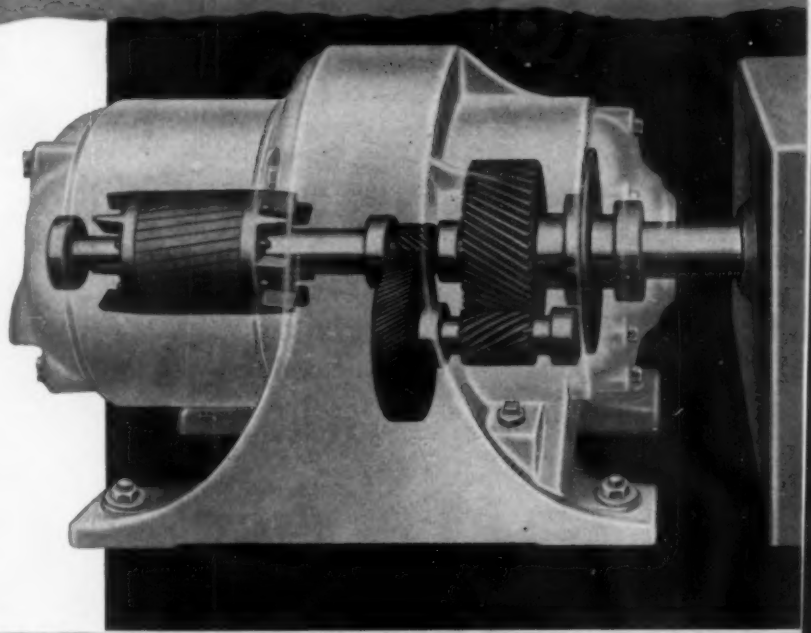
1564 WEST PIERCE STREET • MILWAUKEE 4, WISCONSIN

why use complex contraptions?

simplify...

with this self-contained geared power package...

U.S. Syncrogear motor!



Don't trust your production to cumbersome contraptions that slip... misalign... and create operator safety hazards. Instead of buying a "unit" that requires belts, pulleys, separate motor, and turnbuckle or rails to be added at extra expense... instead of spending costly production time on recurring adjustments—take the easy, simple, economical way to geared power with U.S. Syncrogear Motors. Syncrogear Motors can't slip! Can't misalign! Can't endanger operator! They give you *positive* power delivery in one compact, self-contained package—steady slow shaft-speeds, permanent precise alignment, maximum efficiency and long life. Best of all, U.S. MOTOR dependability! Available in RATINGS ⅓ TO 30 H.P.

U.S. ELECTRICAL MOTORS INC.

BOX 2058, LOS ANGELES 54, CALIFORNIA
OR MILFORD, CONNECTICUT

SEND FOR FREE 16-PAGE BROCHURE... illustrated in full color... on U.S. Syncrogear motors.

FLUID POWER LINES

about applied hydraulics

COVERING THE CRACKS . . . Engineers have a particular talent for covering their office walls with such prosaic decorations as decimal equivalents, assembly drawings, and production schedules. You've got to go out in the shop to find the finer examples of calendar art. We're hoping to add to the drafting room collection with the charts included in *Which Hose Fittings?* Jerry Taborek, author of this article, has come up with an excellent arrangement showing which hose ends and fittings can be used for connecting hose to fluid power components and to tubing.

We figure a lot of engineers will want to save these charts, because one of the best ways of starting a discussion among fluid power designers is to toss out leading questions like: Which do you prefer, swaged or reusable hose ends? How do straight threads compare with pipe threads for leakage control? When do you use a swivel end, or a flange end?

You'll find the article gives some past history on how these types developed, and what you can expect them to do. And if you've got a crack to cover and want to mount the charts, drop us a note for an extra copy.

LOW SPEED AGITATORS . . . You'll find the article on page 65 does *not* describe the subversive activities of red agents in the hotter climes. It's about the use of fluid motors on industrial process tanks. The high torque and low, variable speed are easy requirements for hydraulics. Installations where a number of motors are driven in parallel keep constant pressure and speed with low pressure air controllers actuated by pressure and electrical signals.

REMOTE CONTROL . . . Want to get remote pushbutton control of pressure, direction, speed? See how Cyril Bath used a 28-volt, d-c motor to control relief valve setting in *Motorized Relief Valve for Remote Control.* This miniature motor can also be applied to directional valves and flow control valves.

CYLINDER COURSE . . . If you've ever had the idea that a cylinder is just a tube with a piston in it, turn to the series on cylinders beginning in this issue. Starting with *How To Stop Air Cylinders Smoothly,* author Elmer Heiser brings you his twenty years of experience in fluid power engineering.

EXTRUDING STAINLESS . . . One of the most interesting hydraulic applications we've seen recently was at Extrusions, Inc. where they've developed a press for working stainless steel and titanium. Lots of know-how went into this design. Much of it is in the variable-volume hydraulic system described on page 72.

FROM LIGHTNING TO HERCULES . . . It doesn't take long with Charlie Cannon to find out you're talking with an engineer of long experience in aircraft hydraulics. His work goes back to the Lockheed P-38, so often a welcome sight during the war To find out some of the practical things he's learned since then, read *Manifolded Boosters Improve Hydraulic System Dependability* in the Aircraft Section.

6,000 psi continuous
10,000 psi intermittent

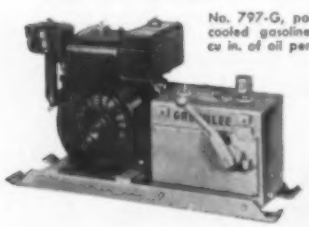
106 or 213 cu in. per min delivery at 10,000 psi

No. 797-E Hydraulic Power Pump with choice of 2-hp or 3-hp a-c electric motor

EXCLUSIVE QUICK APPROACH... AUTOMATIC CHANGE-OVER TO FAST HIGH-POWER DRIVE

GREENLEE No. 797 Hydraulic Power Pumps readily apply to numerous rams, jacks, presses, and special hydraulic installations where high-speed, high-power operation is an advantage. Exclusive GREENLEE fast-approach feature eliminates nearly all time loss ordinarily accumulating while operators wait for the ram to contact the work! Change-over to drive speed is automatic at 6000 psi for smooth, fast, heavy-duty work. Delivers 106 cu in. of oil per minute at 10,000 psi when equipped with a 2-hp a-c motor — 213 cu in. with 3-hp a-c motor. Three-phase 60-cycle 220/440-volt motors; available gasoline-powered units are described below.

Fast hydraulic return of ram is available in every type GREENLEE power pump! All pumps available for either single-action or two-way-action rams.



No. 797-G, powered by 4½-hp air-cooled gasoline engine, delivers 106 cu in. of oil per minute at 10,000 psi.

No. 798 Portable Hydraulic Power Pumps feature two speeds for fast approach, develop 6000-psi continuous, 10,000-psi intermittent pressure. Equipped with a-c motor or gasoline engine. Easily carried by one man.

No. 768 Fast-Approach High-Pressure Hydraulic Hand Pump develops up to 10,000 psi.

TOOLS FOR CRAFTSMEN
GREENLEE

WRITE or attach this page to your letterhead for illustrated data on all these GREENLEE pumps. Our engineering department is equipped to help you on special applications.

GREENLEE TOOL CO., 2446 Herbert Ave., Rockford, Ill.

LETTERS to the editor

Address your letters to: Editor, APPLIED HYDRAULICS MAGAZINE, 812 Huron Rd., Cleveland 15, Ohio.

Distilled Writing

TO THE EDITOR:

Congratulations on the "distilled writing" style for APPLIED HYDRAULICS. I hope more magazines in the business and technical field follow your lead. The change in style puts you in a position to perform a real service to engineers by summing up the reasons and costs of making the change. Such an article will be a useful tool.

G. J. LUNDQUIST
University of California
Radiation Laboratory,
Livermore, California

From time-to-time we'll be including more information about the importance and mechanics of Distilled Writing by way of inserts similar to the one which was published in March.

We're pleased with the many fine comments readers have made about our new style. While we certainly agree with Mr. Lundquist that more engineers can take a cue from Distilled Writing, our major objective is to make APPLIED HYDRAULICS *interesting and valuable to its readers each and every month.*

J.I.C. Standards

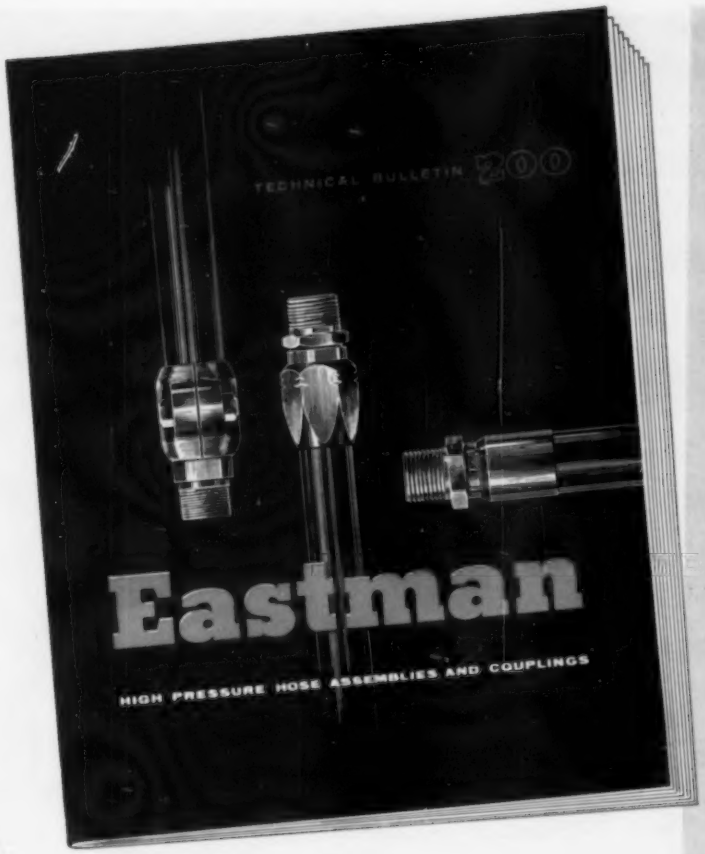
TO THE EDITOR:

In your FLUID POWER DIRECTORY is a complete set of the Joint Industry Conference Standards. Can we get additional copies of the standards? What arrangements have been set up to periodically review these standards to obviate their becoming obsolete?

HOWARD D. FOSTER
Standards Engineer
Wheeling Steel Corp.
Wheeling, W. Va.

To get copies of the standards write: Joint Industry Conference, Box 182, Northend Station, Detroit 2, Mich. These conferences

Continued on page 13



CONVENIENTLY ARRANGED TO HELP YOU MEET THE INCREASING DEMAND FOR HIGHER PRESSURES

Here's an entirely new service concept in catalog arrangement. It is designed to assist Engineers and Purchasing Agents in specifying Multi-Braid Hydraulic Hose and Tube Assemblies to meet the demand for increasing pressure requirements. With pressure as a primary consideration—the right assembly can be selected for the specific equipment on which it is to be used.

Nine major sections are devoted to assemblies suited to all types of high pressure hydraulic applications—complete with tables and specifications, including easy to read dimensional cross section drawings.

Include this new catalog in your files to make it easier to specify the proper assemblies.

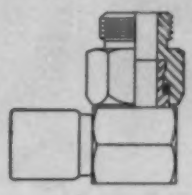
Write for Your Copy Today!

Eastman *first in the field* **MANUFACTURING COMPANY**
Dept. AH-6, MANITOWOC, WISCONSIN

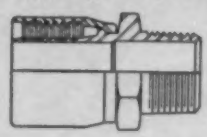
SAFEGUARDING AMERICA'S LIFELINES OF MOBILE POWER

AN INSIDE LOOK AT A *NEW BOOK*

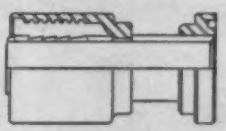
Eastman's new Technical Bulletin offers a new standard in simplified arrangement—for your convenience in specifying—according to your pressure requirements.



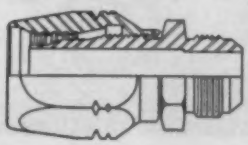
Swivel "O" Ring Male Couplings are available in 45° and 90° angles. Specifications on Page 13.



Permanently Attached Couplings for 2-wire braid hose. Specifications and Details on Page 10.

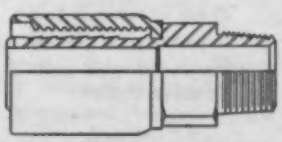


Permanently Attached Flange Head Couplings and Inserts from 0° to 90°. See complete list on Page 21.



2-Piece Reusable Couplings for all high pressure hose. Used for pressures up to 5000 lbs. See Page 25.

Swivel Male Tube Nut "O" Ring Assembly used on formed tubing—described on Page 30.

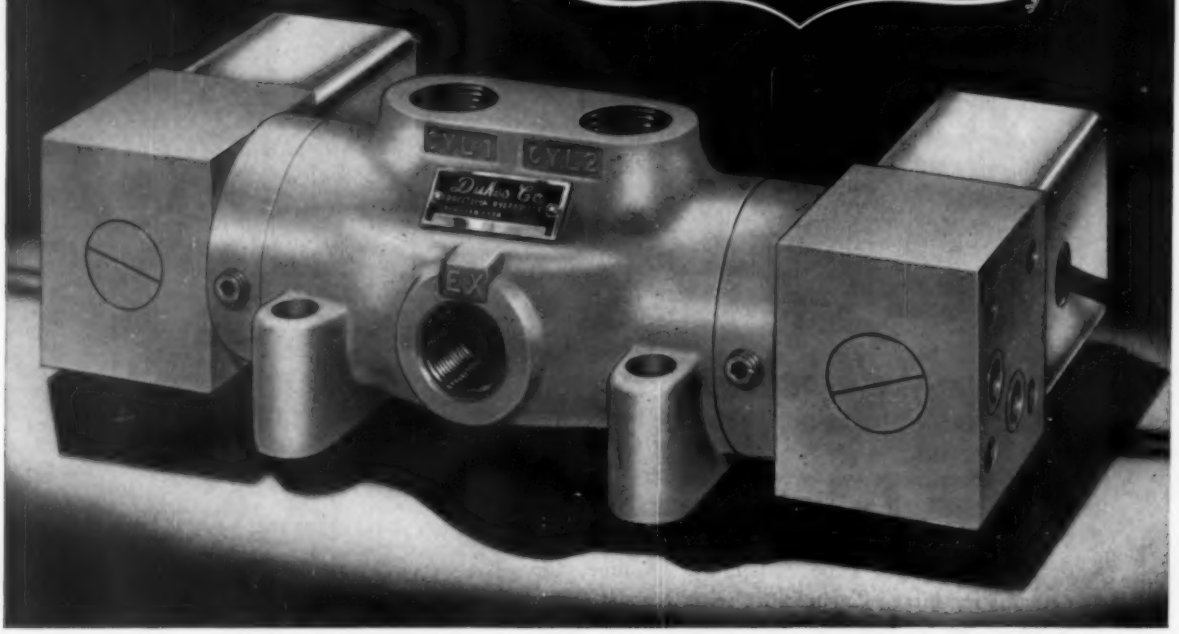


Permanently Attached Couplings for Extreme High Pressures up to 7000 lbs. working pressure, Page 12.

A new line of hydraulic valves SO SUPERIOR

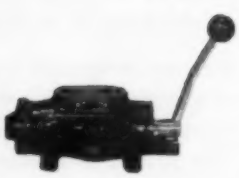
it sets a new standard of comparison . . .

DUKES



UPGRADE your requirements. This new valve will meet them

- Suitable for systems up to 3000 PSI
- Interchangeable mounting dimensions on all models
- Choice of 3 standard spools and 5 alternates, including tandem, at no increase in price
- Dry-seal pipe threads
- Gauge port for testing
- Hardened and ground spools — chrome plated and lapped to fit valve bodies



ALL TYPES AVAILABLE

- solenoid
- air piloted
- oil piloted
- stem operated
- lever operated

Send for complete new DUKES catalog

DUKES Hydraulics

3999 North 25th Avenue • Schiller Park, Illinois • A Chicago Suburb

CIRCLE 34 ON READER SERVICE CARD

LETTERS

have been organized by the automotive companies who invite machine builders and component manufacturers to assist in developing standards which will reduce maintenance and improve safety conditions. There are no established dates for holding these meetings.

Water Hydraulics

TO THE EDITOR:

In the February 1958 APPLIED HYDRAULICS, Allan Morris' special report on components for water hydraulics is an excellent treatise on a system that is gaining more and more popularity. Mr. Morris certainly should be congratulated on the fine and concise form in which this article is presented.

If it is possible we would like to obtain reprints for our key engineering personnel.

A. R. GEISZIER
Senior Staff Engineer
The Wean Engineering Company, Inc.
Warren, Ohio

Reprints of this 16 page report are available. Single copy price is 50c. In quantities of ten or more the price is 25c.

Piston vs Bladder Accumulator

TO THE EDITOR:

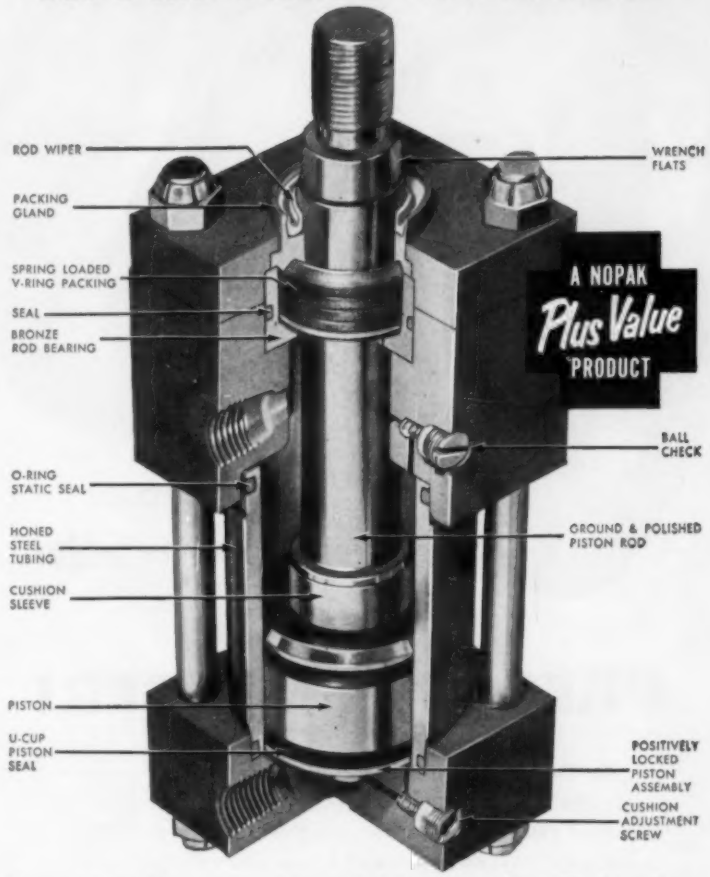
Commendations on your fine article on Pressure Generators (April 1958 issue).

In the article "Designing with Gas-Oil Accumulators" there is the statement: "An advantage of piston-type accumulators is the ability to deliver all the stored fluid, etc." This statement leaves one with the innuendo that bladder type accumulators will not do this.

There are bladder type accumulators which also accomplish complete discharge and there is nothing about the inherent principle of bladder separators which would cause them to fail to make full discharge unless bad design was involved.

Continued on next page

POWERIZE with NOPAK
for Plus Value Performance



Class 3, Square Head Hydraulic Cylinders

Pressures 3,000 P. S. I. operating, 5,000 P. S. I. proof

Check these Class 3 Plus Values . . .

- Interchangeable with other well-known square head, hydraulic cylinders
- NOPAK Class 3 Cylinders comply with J.I.C. standards
- Positively locked, one-piece concentric piston
- Piston Construction . . .
  Self-compensating U-cup *(standard)*
  Multiple seal piston ring *(optional)*
- Expansion Joint Type Tube Seal † . . .
  Cannot extrude at excessive shock pressures
  Provides bleeder by-pass location at highest internal point
  † a NOPAK *first* since 1948
- Steel Construction for Strength and Durability . . .
  Heavy Honed Steel tube, Steel heads, High Tensile Steel piston rod and tie rods
- Multiple V-Ring Rod Seal and Wiper
  Requires no adjustment
  Assures longest possible trouble-free operation
- Cushion Adjustment Screw and Ball Check . . .
  Maintains minimum head dimension
  Identical seats provide interchangeability
- Bore sizes from 1½" through 12"
- 18 Standard mountings
- More power per dollar

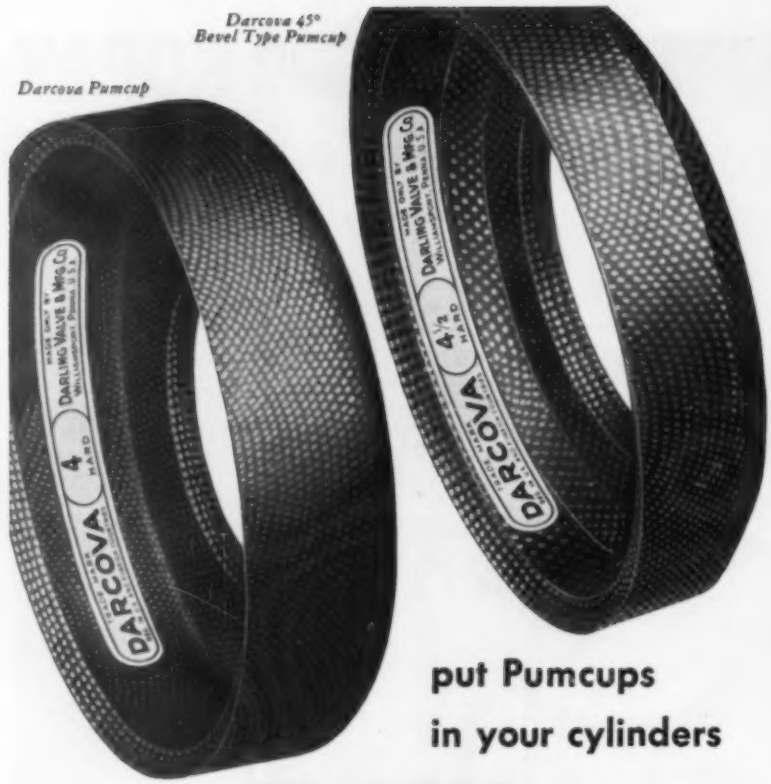
Ask for Catalog 103 . . . It contains complete Data and Dimensions.

NOPAK VALVES and CYLINDERS

GALLAND-HENNING NOPAK DIVISION • 2743 S. 31st Street • Milwaukee 46, Wisconsin

Darcova 45° Bevel Type Pumcup

Darcova Pumcup



put Pumcups in your cylinders

TO HOLD PRESSURE LONGER!

In Darcova Pumcups a sound engineering principle has been combined with precision tolerances and extremely durable compositions to provide exceptionai efficiency and life in hydraulic, air, and reciprocating pump cylinders of all kinds.

Unlike ordinary piston packing, precision Pumcups are engineered to minimize friction load while hugging cylinder walls on every pressure stroke. Regardless of eventual wear, efficiency *stays* high! So there's far less down-time and need for replacement.

Pumcups are made in a wide range of sizes, types and texture-engineered compositions, including 100% Nylon, for all kinds of pressure-temperature-fluid conditions. Send for Pumcup Bulletin 5503 and weigh all the facts!

DARLING VALVE & MANUFACTURING CO.
Williamsport 15, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS

LETTERS

The outstanding advantage of the bladder type accumulator is, as you have stated, its ability to absorb transient line shocks with a rapid rise time. The mass and friction of piston-type separators are a distinct handicap in this instance.

W. C. TRAUTMAN
Chief Engineer
Hupp Aviation Company
Chicago, Illinois

The major manufacturer of bladder type accumulators recommends, for longer service life in rapid cycling operations: "the bladder should not be compressed to less than 1/3 the total volume of the shell or expanded to more than 2/3 the total volume." This is the reason for our pointing out that a piston type accumulator can deliver all the stored fluid.

Wants a Booster

TO THE EDITOR:

In the April APPLIED HYDRAULICS you discussed reciprocating boosters to 30,000 psi. We are interested in a reciprocating booster to deliver approximately 1 gpm at 15,000 to 18,000 psi.

J. MUNDBROT
Mechanical Engineer
Globe-Union Inc.
Milwaukee, Wisconsin

Names of manufacturers have been forwarded.

Fluid Power Directory

TO THE EDITOR:

Please tell me how I may obtain a copy of your "Master Catalog of Fluid Power Products".

JOHN COSTELLO
Engineering Associates
Los Angeles, Calif.

Latest edition is the 1958/59 Fluid Power Directory published in November 1957. This 796 page volume can be ordered from APPLIED HYDRAULICS. Price per copy is $6.50. A Bulletin Sheet is available giving complete details about the contents of this valuable handbook. ▼▼▼

CIRCLE 31 ON READER SERVICE CARD

CIRCLE 132 →

AFCO

37° FLARED "J.I.C." and FLARELESS TUBE • PIPE and HOSE

FITTINGS

STEEL • ALUMINUM ALLOY • BRASS • STAINLESS STEEL

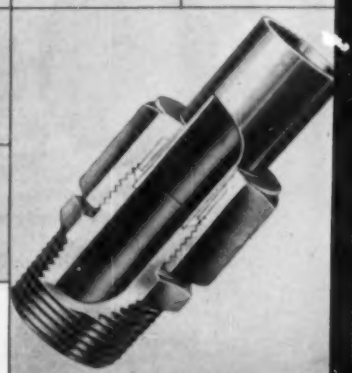
37° FLARED "J.I.C."

FLARED TUBE FITTINGS and PIPE FITTINGS

J 815 TUBE UNION	J 815-X-X REDUCER UNION						
J 816 MALE CONNECTOR	J 854 FEMALE CONNECTOR	J 821 TUBE ELBOW	J 822 MALE ELBOW	J 877 LONG MALE ELBOW	J 878 EXTRA LONG MALE ELBOW		
J 823 MALE ELBOW 45	J 855 FEMALE ELBOW	J 824 TUBE TEE	J 825 MALE SIDE TEE	J 826 MALE RUN TEE	J 856 FEMALE SIDE TEE		
J 857 FEMALE RUN TEE	J 827 TUBE CROSS	J 832 BULKHEAD UNION	J 833 BULKHEAD ELBOW	J 834 BULKHEAD TEE	J 837 45° BULKHEAD ELBOW	J 806 TUBE PLUG—FLARED	J 860 TUBE END REDUCER
J 818 TUBE NUT	J 819 TUBE SLEEVE	J 820 TUBE CAP—FLARED	J 924 BULKHEAD LOCKNUT	910 PIPE CONNECTOR	911 PIPE NIPPLE	912 REDUCING BUSHING	913 SQUARE HEAD PLUG
914 90° STREET ELBOW	915 45° STREET ELBOW	916 PIPE ELBOW	917 PIPE TEE	918 PIPE CROSS	932 HOLLOW HEX PLUG	933 HEX HEAD PLUG	840 HOSE NIPPLE

FLARELESS TUBE FITTINGS

				F 815 TUBE UNION	F 815-X-X TUBE UNION REDUCER	842 90° HOSE ELBOW	844 45° HOSE ELBOW
F 816 MALE CONNECTOR	F 854 FEMALE CONNECTOR	F 821 TUBE UNION ELBOW	F 822 90° MALE ELBOW	F 823 45° MALE ELBOW	F 855 FEMALE ELBOW	F 824 TUBE TEE	F 825 MALE SIDE TEE
F 826 MALE RUN TEE	F 856 FEMALE SIDE TEE	F 857 FEMALE RUN TEE	F 827 TUBE CROSS	F 832 BULKHEAD UNION	F 833 90° BULKHEAD ELBOW		
F 834 BULKHEAD TEE	F 837 45° BULKHEAD ELBOW	F 860 TUBE END REDUCER	F 818 TUBE NUT	F 819 TUBE SLEEVE	F 924 BULKHEAD LOCKNUT		
F 929 TUBE CAP	F 806 TUBE PLUG						



FLARELESS

AFCO FITTING CO.

5300 Harvard Avenue Cleveland 5, Ohio

SEND FOR CATALOG ON THE COMPLETE LINE OF — AFCO INDUSTRIAL FITTINGS

ACCO
Helicoid Gage
U.S.A.

NOTHING BUT THE BEST IN GAGES FOR WORKING PRESSURES FROM 30" VACUUM TO 10,000 p. s. i.

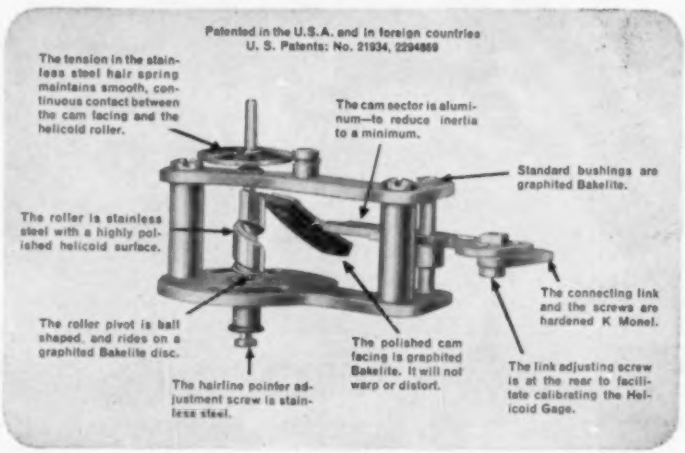
Shock-Proof Cam Actuation (no gears—no teeth) Makes Helicoid Gages Ideal for Hydraulic Services

Designed for pulsating and impact hydraulic service, the Helicoid movement releases at zero in the event of sudden pressure reduction. This eliminates shock on pointer and movement by reducing impact of pointer against pointer stop pin. This protects the gage mechanism where gages may be subject to occasional vacuum.

The superiority of Helicoid Gages is most evident in severe service—wherever a gage is subjected to violent pressure pulsations or certain severe mechanical vibrations.

The *sustained accuracy* of Helicoid Gages over *millions of cycles* is explained by the details of design and construction of the Helicoid movement shown at the right.

Rolling action of the cam facing against the roller surface . . . graphited Bakelite bushings, roller pivot base and cam facing . . . K Monel connecting links and screws . . . all such Helicoid features protect against wear and corrosion and assure sensitivity, sustained accuracy and trouble-free operation through millions of cycles.


Patented in the U.S.A. and in foreign countries
U. S. Patents: No. 21934, 2294859
The tension in the stainless steel hair spring maintains smooth, continuous contact between the cam facing and the helicoid roller.
The cam sector is aluminum—to reduce inertia to a minimum.
Standard bushings are graphited Bakelite.
The roller is stainless steel with a highly polished helicoid surface.
The connecting link and the screws are hardened K Monel.
The roller pivot is ball shaped, and rides on a graphited Bakelite disc.
The polished cam facing is graphited Bakelite. It will not warp or distort.
The link adjusting screw is at the rear to facilitate calibrating the Helicoid Gage.
The hairline pointer adjustment screw is stainless steel.

HELICOID GAGE CARTRIDGE SNUBBER

(Patent pending)

This is a simple, effective throttling device to reduce or eliminate pulsations of the gage pointer. There are no moving parts, no adjustments needed. Available in three types in powdered bronze or stainless steel for air, gas, water, steam, medium or heavy liquids.

Enlarged cutaway view

Threaded cartridge body for assembly in any Helicoid Gage tapped socket shank

EASIEST ADJUSTMENT AND CALIBRATION

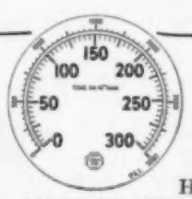
Only Helicoid Gages have the external pointer adjustment pictured here. The Helicoid type adjustment cannot be jarred out of position.

Calibration of Helicoid Gages is accomplished easily, without removing dial or pointer, because the link adjusting screw is at the rear of the system.

TUBES BUILT FOR MILLIONS OF PRESSURE PULSATIONS

To fit the wide range of applications, Helicoid Bourdon tubes are available in four materials—alloy steel, K Monel, stainless steel and phosphor bronze.

All Helicoid tubes are made from seamless tubing and are carefully designed to give maximum torque and minimum stress. When used within the dial range, they will withstand many millions of pressure pulsations and will not stretch, leak nor crack.



DOUBLE SCALE DIAL SHOWS TONS ON RAM AND PSI

Helicoid Gage dials are supplied in jet black with white figure markings or in dull white with black figure markings. They are constructed of laminated phenol with a transparent plastic surface and the longest possible scale length for more accurate readings. They are non-corroding, will not discolor nor fade and will not crack, chip nor peel.

Helicoid Gage Division
AMERICAN CHAIN & CABLE

929-H Connecticut Avenue • Bridgeport 2, Connecticut

ACCO

TRADE MARK

Helicoid gives you all these features at prices that are competitive in the quality gage field

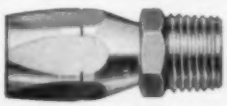
Design High Pressure Fluid Systems up to 5000 psi. with Aeroquip Hose and Reusable Fittings

1509 Hose									1508 Hose			
4	6	8	12	16	20	24	32	Dash size (in 1/16")	6	8	12	16
1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	O.D. Tube Size	3/8	1/2	3/4	1
1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	Hose I.D.	3/8	1/2	3/4	1
1 1/16	27/32	31/32	1 1/4	1 5/16	2	2 1/4	2 3/4	Hose O.D.	27/32	1 5/16	1 1/4	1 5/16
5000	4000	3500	2250	1875	1625	1250	1125	Working psi.	5000	4000	3000	3000
20000	16000	14000	9000	7500	6500	5000	4500	Min. burst psi.	18000	16000	12000	10000
4	5	7	9 1/2	11	16	20	26	Min. bend radii	5	7	9 1/2	11

All dimensions in inches.

End Fittings Available

J.I.C. Swivel—1/4" to 2"

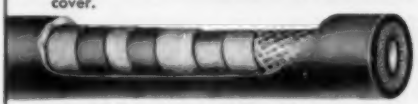


Male Pipe—1/4" to 2"

Split Flange ("O" Ring Shoulder)—1/2" to 2"

Elbows (45° & 90°) —1/4" to 1", in swivel nut; 1/2" to 2" in split flange and standard 4-hole flange ends.

AEROQUIP 1509 HOSE for high working pressures in temperature range from —40° F. to +200° F. Hose construction: seamless synthetic inner tube; double wire braid reinforcement; oil, mildew and abrasion resistant synthetic rubber cover.



AEROQUIP 1508 HOSE for very high pressure and high surge pressure systems, temperatures from —40° F. to +200° F. Hose construction: seamless inner tube; multiple spiral wrap reinforcement; oil, mildew and abrasion resistant rubber cover.

Use of flexible hose lines in the design of high pressure fluid systems can promote longer, trouble-free service life. This advantage is possible because flexible hose lines have the resiliency to withstand high surges, vibration and shock. These strains, occurring particularly in hydraulic systems, can cause early failure of rigid lines.

To meet all high pressure line requirements, Aeroquip offers two hose types: 1509 Hose with wire braid reinforcement and 1508 Hose with wire wrap reinforcement. Engineering tests conducted by Aeroquip show that the spiral wrap hose construction which is used in 1508 Hose gives longer service life in fluid systems subject to frequent or abnormal surge pressures.

The flexibility of Aeroquip Hose Lines permits quick and easy installation, even in confined spaces, without the forming and fitting required when using tubing or piping. In many cases, savings in installation time alone can pay cost of flexible hose lines used.

Aeroquip Hose Lines are unique in that every Aeroquip Fitting is detachable and reusable. In designing fluid systems, reusable fittings offer two advantages. First, mock-ups can be made and easily modified, using hand tools to assemble hose lines. Second, hose assemblies can be made up in production quantities from Aeroquip Bulk Hose and Reusable Fittings without expensive swaging machines in the manufacturer's plant. This benefit is also passed on to the equipment purchaser when replacement hose lines are needed. A small supply of bulk hose and a few spare fittings can be used to make replacements anywhere. Aeroquip maintains an extensive network of distributors to serve users of Aeroquip Hose Lines.

Complete catalog information and engineering assistance is available on Aeroquip 1509 and 1508 Hose Lines. A 16-page guide on planning and installing fluid systems with flexible hose lines is also available. Mail the coupon below for literature you desire.

SEE OUR CATALOG PAGES IN SWEET'S PRODUCT DESIGN FILE, SECTION 7d.

Aeroquip Corporation
Jackson, Michigan

Please send a copy of

☐ "Guide for Routing and Installation of Aeroquip Flexible Hose Assemblies"

☐ Catalog 202

☐ Please have engineering rep call me

AH-6

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

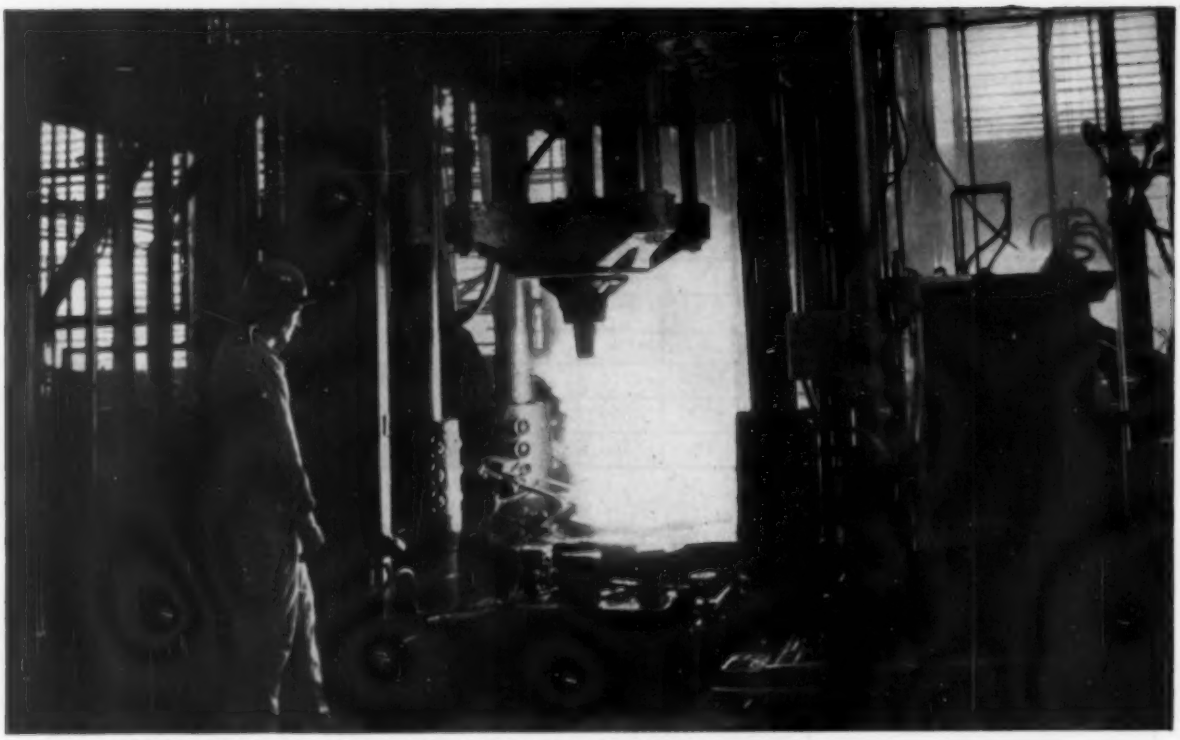
Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

INDUSTRIAL DIVISION, VAN WERT, OHIO • WESTERN DIVISION, BURBANK, CALIFORNIA
AEROQUIP (CANADA) LTD., TORONTO 19, ONTARIO

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD



AT A FAMOUS ORDNANCE PLANT IN NORTHERN LOUISIANA:

600-Ton Lubrication Job for Cities Service!

The huge 600-ton press above is one of several at a well known Louisiana ordnance plant operated by the Remington Rand Division of Sperry Rand Corporation.

A big machine, it naturally poses a big lubrication job... but not so big that Cities Service Pacemaker Oil can't take it in stride. With unusually high viscosity index and superior fortification against oxidation, corrosion and rust, Pacemaker is a natural for the task.

Likewise, throughout the various stages of producing artillery shells—the end product—Cities Service lubricants are hard at work.

Clearly, there's little room for error here—either in the product itself or in the machines that make it. That's why Cities Service lubricants were chosen ... and it's an equally good reason for making them *your* choice.

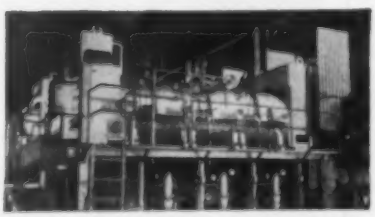
For a survey of your plant's lubrication needs, talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

HOW THE ORDNANCE PLANT USES CITIES SERVICE LUBRICANTS

MACHINE	LUBRICANT
Large presses	Pacemaker 3 Hydraulic Oil
Airlines	Pacemaker 1
Speed reduction units	Pacemaker 6
Worm gear reduction units	Optimus 6
Package compressor units	Pacemaker 5
Metal working machines requiring a water soluble cutting oil	Chillo A
General Lubrication	Trojan Gear Oils, Trojan H-2 Grease

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



High Speed Gas Furnace heats steel to 2660 degrees F. All lubrication is supplied by Cities Service products.

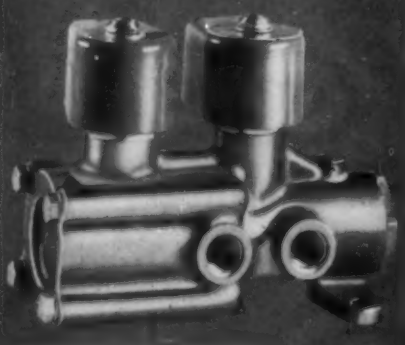
Partially Finished Shells await final forming. Unusual number of forming operations are required to produce final product.

Forming Press does final forming of artillery shells. The press is lubricated by Cities Service Pacemaker Hydraulic Oil.

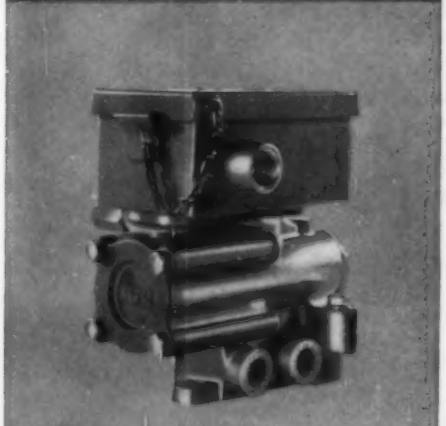
CIRCLE 25 ON READER SERVICE CARD

Now available: full line of ASCO 4-way solenoid valves

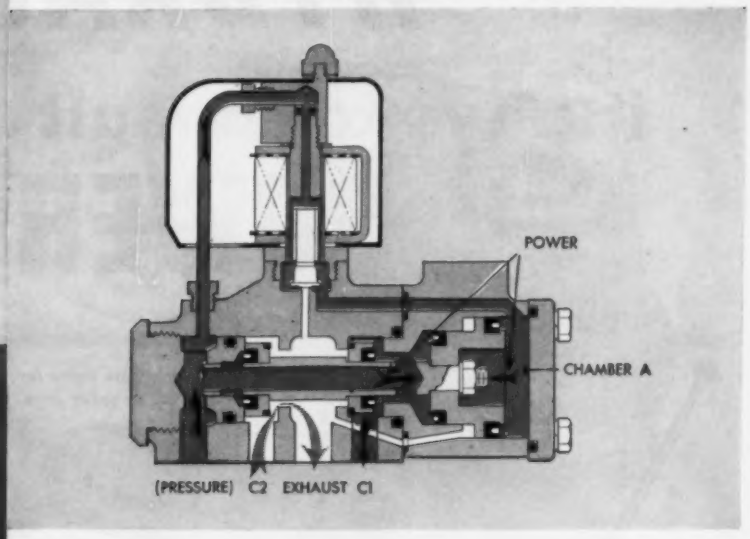
Single Solenoid: operates when solenoid is energized; returns automatically when de-energized.



Dual Solenoid: operates when either solenoid is energized; will not return until opposite solenoid is energized. Solenoids may be energized continuously or momentarily.



J.I.C. Construction: single and dual solenoids, with sub-plate mounting.



power driven in both directions by line pressure

Now available in ⅜" through 1" sizes, these valves are positive in action. When the solenoid is de-energized, *line pressure* applied to the top of the pilot core forces it off the seat, eliminating possible sticking caused by residual magnetism. *Line pressure* is applied to Chamber A, moving the piston-disc assembly to the left. When the solenoid is energized, Chamber A is exhausted and *line pressure* drives the piston to the right.

absolutely tight seating — no leakage

Combination of metal to metal and resilient seating provides dead tight shut-off — even on air. No grinding, lapping or close adjustments are necessary.

Available in standard, watertight or explosion-proof solenoid enclosures, the Bulletin 8344 permits cycling rates to 850 per minute — mounted in any position. Design simplicity eliminates maintenance problems.

J.I.C. construction available

These 4 way valves are available in all sizes to meet J.I.C. (Joint Industry Conference) standards. Valves are provided with sub-plates, vapor-proof solenoid enclosures, and manual overrides, and are electrically inoperative when the cover is removed.

New ASCO Condensed Valve Catalog No. 201 is now available. Write today for this basic reference on solenoid valves.

AUTOMATIC TRANSFER SWITCHES
SOLENOID VALVES ELECTROMAGNETIC CONTROL

Automatic Switch Co.
50-B Hanover Road, Florham Park, N. J. FRontier 7-4800

ASCO

When it's a question of
HYDRAULICS
it pays to consult
POWER JACKS

PUMPS and JACKS

Hand Operated Pump

Motorized Pump for low voltage or mains supplies

Swash Plate Pump for direct or pulley drive.

Retraction Jack

Extension Jack

Double Acting Jack (Extension and Retraction)

BRING YOUR HYDRAULIC PROBLEMS TO US-

Our Technical Service is at your disposal

VALVES

2 way or 4 way valves for Hand Operated Pump

Solenoid Valves push open or push closed

Sensitive Lift Valve for hand or foot operation

3 or 4 way open centre valve for motorized equipment

POWER JACKS LIMITED

Send for illustrated technical brochure. Publication No. F/223

MAYLANDS AVENUE, HEMEL HEMPSTEAD, ENGLAND. Cables: NEWSORBER, HEMEL HEMPSTEAD.

A MEMBER OF THE NEWTON GROUP

NEW!

SAVE TIME! TROUBLE! MONEY!

Handy Gauge tells "O" RING thickness and O. D.

Three "O" Ring thicknesses are in the Kit and the gauge mounted on the side gives you thickness measurements. By doubling the cross section thickness of the ring and adding the result to the I. D. (shown on each peg) the result is the O. D. of the ring. Use this gauge for rings removed from equipment as well as those in the Kit.

UNIVERSAL
SELECT "O" RING KIT No. 2

180 "O" RINGS
SIZES 1 to 25

Fills Replacement Needs on 85% of All Industrial Equipment

No hunting for Needed Sizes! Efficient, patented and shock resistant plastic case shows at a glance the sizes of "O" Rings in the Kit. Each peg is accurately sized and no other size ring will fit that peg. Interchange information of all leading producers of "O" Rings supplied with each Kit. All manufacturers' numbers converted to Universal numbers.

Silicone Rubber, Teflon, Butyl and Leather Back-up Washer Kits also available – write for prices.

Distributorships available in several profitable areas.

Providing bearing service in the North

BEARINGS, INC.

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute • PENNSYLVANIA: Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • NEW JERSEY: Camden
NEW YORK: Buffalo, Bolanrol Corp. • MARYLAND: Baltimore • DELAWARE: Wilmington

and In the South

DIXIE BEARINGS INCORPORATED

FLORIDA: Jacksonville • GEORGIA: Atlanta • KENTUCKY: Louisville • LOUISIANA: Baton Rouge • New Orleans
N. CAROLINA: Charlotte • Greensboro • S. CAROLINA: Greenville • TENNESSEE: Chattanooga • Kingsport • Knoxville • Nashville

Fill in and Mail Today!

BEARINGS, Inc., 3640 Euclid Ave., Cleveland 15, Ohio

Dear Sir:

Please send us_____ Universal "O" Ring Kits at $24.50 each.

(Value of "O" Rings if purchased separately $30.)

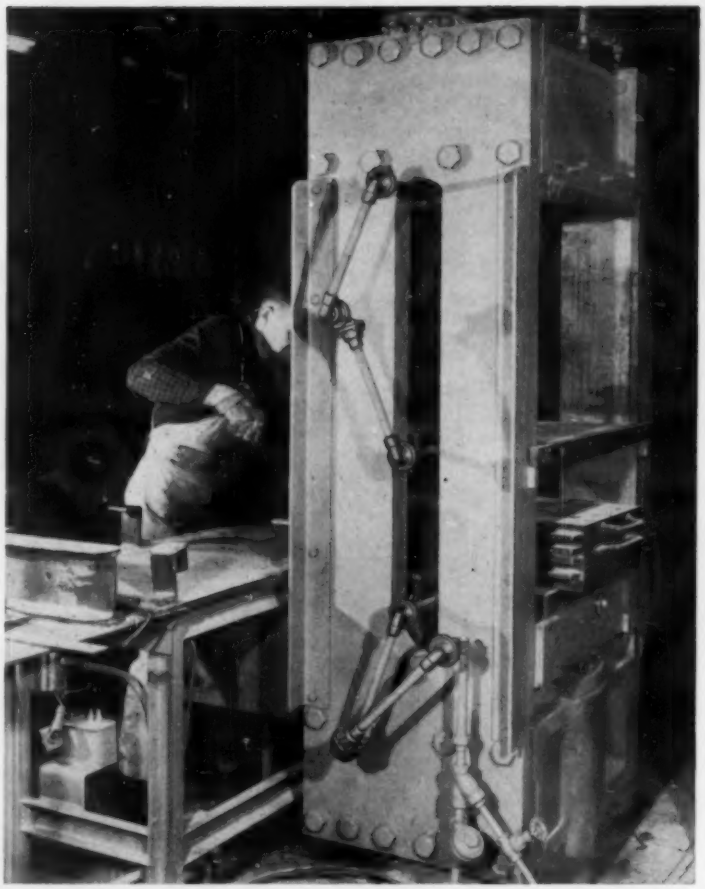
Name_____

Firm_____

Address_____

City_____ Zone____ State_____

STEEL LINES FOLD LIKE AN ACCORDION
Typical of diverse swivel joint applications, newly designed Chiksan Discpak joints are installed on the steam lines of a platen press. This new type swivel joint, designed for hot gas and steam, allows inexpensive packing replacement without removing swivel joint from line.



WHEN *design*
DICTATES
METAL LINES . . .

SOLVE LINE FLEXING PROBLEMS

with **CHIKSAN SWIVEL**

Chiksan swivel joints allow metal lines to be flexed in predetermined travel arcs, eliminate hose rupture, reduce maintenance and replacement costs.

Where tight bends in pressure hose make wide loops necessary, Chiksan swivel joints, conversely, permit compact placement of lines. When used with hose, Chiksan swivel joints shorten hose lengths and also lengthen hose life by minimizing tight bend and torsional fatigue.

Chiksan swivel joints are available from stock in a wide range of materials, temperatures, and pressures to meet practically every design requirement. Chiksan swivel joint packing units are designed for specific services. For example, packings have been developed to efficiently handle non-inflammable hydraulic fluids. Write today for catalog and name of nearby sales engineer.

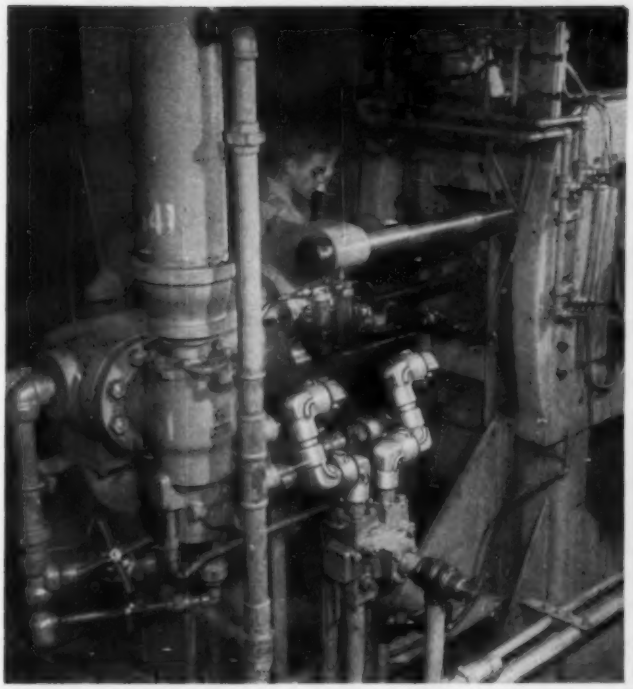
LONG SERVICE LIFE ➤
Chiksan swivel joints deliver years of service with only occasional maintenance attention. All-steel hydraulic lines on Flash-Butt welder, shown at right, allow lines to shift as machine is adjusted to handle various work.

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

CHIKSAN

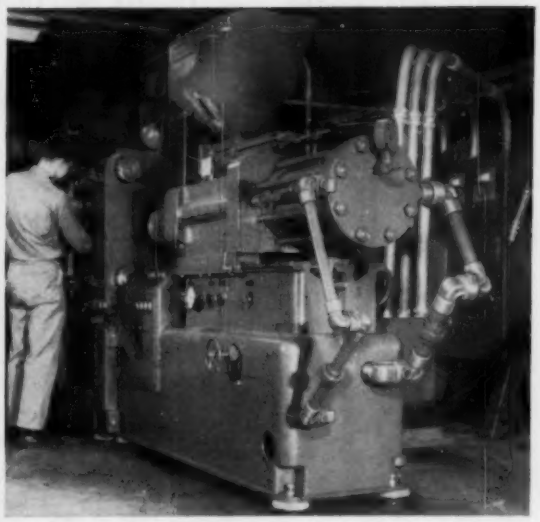
CHIKSAN COMPANY—BREA, CALIFORNIA • CHICAGO 5, ILLINOIS • NEWARK 2, NEW JERSEY

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries Chiksan Export Company • Chiksan of Canada Ltd



NO HOSE BURST DANGER HERE...

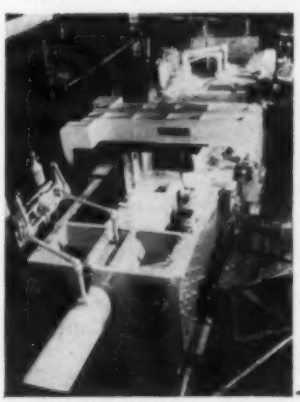
Critical lines take on a new measure of safety with all-steel flexible units replacing pressure hose. These all-metal swivel jointed lines shown on a die casting machine above, eliminate damaging hose ruptures, and reduce fire hazard, fluid loss and setup time by 75%.



PRESSURE? TEMPERATURE? CHIKSAN MEETS THE NEED...

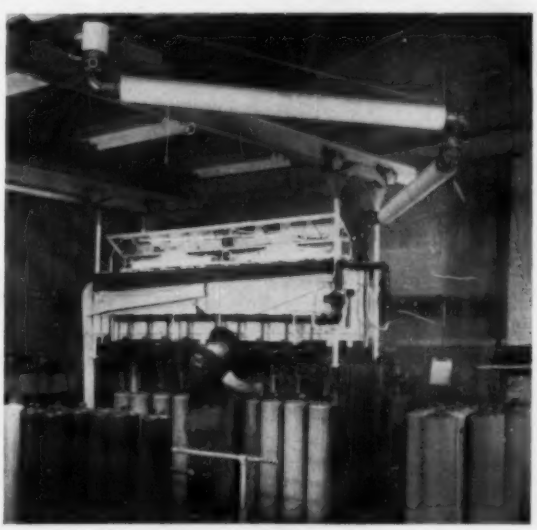
Over 2,000 different types, styles and sizes in a variety of temperature and pressure ratings are available to meet your design needs. This plastic injection molding machine, above, uses two different sizes of Chiksan swivel joints on its hydraulic lines.

JOINTS



NO LIMIT ON LINE DESIGN

Free swiveling action in 1, 2 and 3 planes permits design of compact lines to meet any requirement. This overhead line in service at a water softener regenerating plant permits shift from one setup of tanks to another for faster handling of tank regeneration.



#58-31

CHIKSAN COMPANY
330 NORTH POMONA AVENUE, BREA, CALIFORNIA

Please send me copy of your latest catalog

Name_____ Company_____

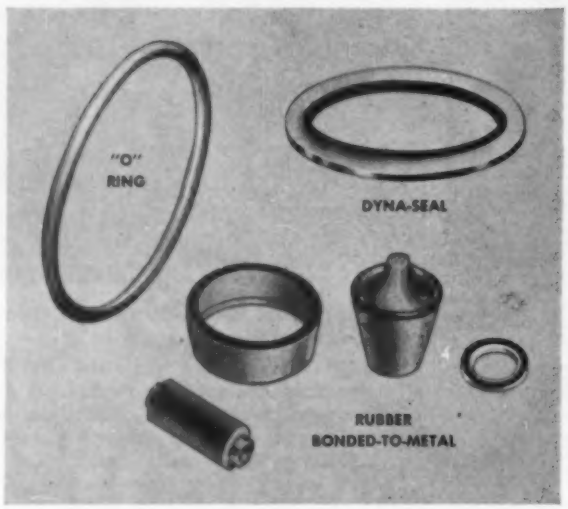
Title_____ Address_____

City_____ Zone_____ State_____

Precision Seals

engineered specifically for your product

SIMPLE
RELIABLE
LOW COST
SPACE SAVING



"O" RINGS—Over 100 Inspections and Tests to assure dependable, accurate "O" Rings to meet all specifications. Prompt shipments from stock.

DYNA-SEALS—For face-to-face sealing. This rubber bonded-to-metal seal eliminates special machining, cuts assembly costs and is reusable. Sizes for No. 5 screw to 1¼" bolt.

RUBBER BONDED-TO-METAL—Engineered parts for specialized sealing services. Exclusive processes assure accuracy, dependability and long life.

Have a sealing problem? You'll find the answer at Precision. There's a Precision Engineer ready to help you.

Specify Precision—first in Quality

Precision Rubber Products Corporation • "O" Ring and Dyna-seal Specialists

Dept. 1, Oakridge Drive, Dayton 7, Ohio Canadian plant at: Ste. Thérèse de Blainville, Québec

FUTURE EVENTS

June 9-12: American Society of Mechanical Engineers national conference on materials handling. Public Auditorium, Cleveland, Ohio.

June 9-13: Fourth Annual Automation Seminar at The Pennsylvania State University. Theme, "Cost Reduction Through Automation". Contact Chester Linsky, in charge of automation at the University, for further information.

June 9-20: NCIH course in Oil Hydraulics at Illinois Institute of Technology. For information write: Dr. F. D. Carvin, M.E. Dept., Illinois Tech, 3300 S. Federal St., Chicago 16, Ill.

June 22-27: ASTM annual meeting and apparatus exhibit. Hotel Statler, Boston, Mass. For more information write the society's office, 1916 Race St., Philadelphia 3, Pa.

July 8-18: Course titled Fluid Power Control at Massachusetts Institute of Technology. For information write: Dr. J. L. Shearer, M.I.T. Cambridge 39, Mass.

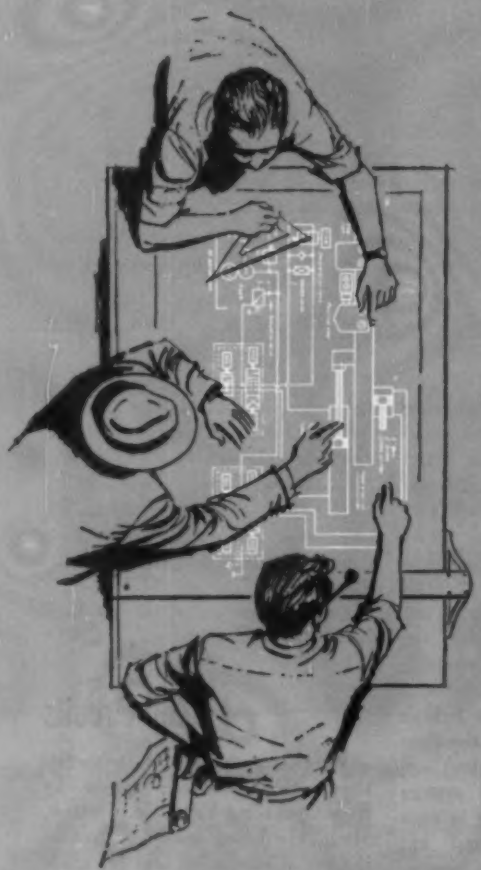
September 15-19: Instrument Society of America, 13th annual instrument automation conference and exhibit, Convention Hall, Philadelphia, Pa.

September 29-October 3: ASTE Semi-Annual Meeting and Western Tool Show. Shrine Exposition Hall, Los Angeles, Calif.

October 16-17: NCIH 14th Annual Meeting. Sherman Hotel, Chicago, Ill. For complete information write Raymond D. Meade, Conference Secretary, Illinois Institute of Technology, Chicago, Ill. ▼▼▼

CIRCLE 91 ON READER SERVICE CARD

HYDRAULICS IN YOUR NEW DESIGN?



call the man from Webster

. . . and right at the start — before design problems pyramid costs and delay production. The man from Webster is a specially trained hydraulics engineer, armed with the latest technical know-how on hydraulic power application. He'll work with you, for you, to make hydraulics serve your product better. And, chances are, one of the more than 600 Webster pumps and fluid motors will be the key to successful, efficient operation.

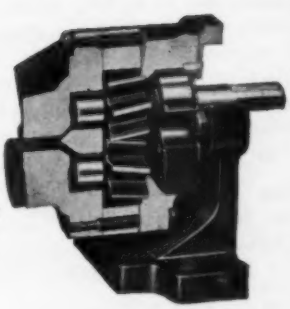
OIL HYDRAULICS DIVISION

WEBSTER ELECTRIC
MELROSE 3-3511
RACINE · WIS

MORE THAN 600 WEBSTER PUMPS AND FLUID MOTORS

Capacities: *1/5 to 30 GPM*
Pressures: *Up to 1500 PSI*
Speeds: *Up to 3600 RPM*
Drives: *Direct or Geared*
Torques: *Up to 60 in. lbs./100 PSI*
Available with or without built-in relief valves

H-109



☐ *Have THE MAN FROM WEBSTER contact us—*

- Please send the following -

☐ *Complete hydraulic catalog of pumps and valves*

☐ *New information or data as published*

Name _____
Title _____
Company _____
Street _____
City _____ State _____

CIRCLE 128 ON READER SERVICE CARD

BRIEFS about fluid power

FLUID POWER IN THE MOON AGE

Here are some answers for anyone uncertain about the future of hydraulics. These three applications may seem fantastic at first glance, but are certainly within the realm of possibility.

They were submitted in an Outstanding Design Contest sponsored annually by J. S. Staedtler, Inc., makers of Mars drafting pencils. Each was awarded a $100 cash prize.

Imagination of this type is proof that the sky is the limit to what can be done hydraulically.

• **Telescoping Hydraulic Bridge**—With no overhead structures to obstruct view or interfere with radio reception, the automatic bridge is operated by pressure pumps that draw water from the canal into the hollow structure, and hold it shut with water pressure. When a boat approaches, an electric eye gives the signal and pressure is released. Counterweights pull the telescopic sections together, and the bridge opens. Heating units keep the electric eye free from snow and ice, and a brine anti-freeze system keeps the bridge operating in zero weather. Design submitted by, Robert J. Companik, Chicago, Ill.

• **Roll Your Own**—Giant machine squeezes out paved roads like toothpaste, chewing up unmapped earth, compacting it with asphalt or macadam, stabilizing it and spreading a ribbon of completed road as it rumbles along. Crew and engineers ride in an air conditioned cabin, and monitor the automatic process by control instruments. Machine of this type would aid in relieving increasing traffic congestion. Submitted by Russ Henke, Elm Grove, Wis.

• **Brings 'em Back Alive**—Guided missile has a pair of wings, locked forward at blast-off, later snapped into flying position by hydraulic cylinder control to ease the missile safely back into the atmosphere. Designed by Carl J. Rauschenberger, Anaheim, Calif., the missile has a glass nose cone, heatproof to withstand the destructive friction of re-entry, which retracts to admit air to a jet engine on the return flight. ▼▼▼

Model Circuits

Working models of industrial pneumatic operations made by Ross Operating Valve Co., Detroit, Mich. are being used to promote industrial education and for trade show displays.

A mechanically operated bench press has been converted to air operation in one model. Unit shows how a press can be set for continuous or single-stroke operation by employing a selector valve.

Pressure testing of vessels is shown in another unit, demonstrating a completely automatic testing cycle.

In a simulated clamping and welding operation, an air circuit provides for independent clamping with a pneumatic interlock which assures that welding will not begin until all clamps are in place. ▼▼▼

Continued on page 30

TEST PROVES C/R MOLDED CUP

Conventional leather cup. Note rounded shape and thinness of material at heel.

C/R *molded* leather cup. Note sharp angle and full thickness of material at heel.

New molded C/R cups* stand up longer... cut down replacement costs

Compare the wear on these piston cups shown in the unretouched photographs above. They were tested in a hydraulic cylinder at 6000 p.s.i. for 3000 cycles. The one at the right is a Sirvis-Conpor molded leather cup. The other is a conventional leather cup. Features of the C/R molded cup that make it so obviously superior are greater density, the sharp, rather than rounded heel, and the fact that it is pre-formed to the shape which conventional cups are forced to assume under pressure. This eliminates operational stress and flexing that conventional cups undergo, and contributes greatly to longer service life.

Right now, molded C/R cups are providing greatly increased service life in hydraulic cylinders in such heavy duty applications as farm and road building equipment and steel mill equipment at oil pressures up to 3500 p.s.i., and 150 p.s.i. in air cylinders. If you face a difficult packing problem that requires high durability and efficiency . . . it will pay you to consider this new, improved C/R design.

*Available in J.I.C. standard and other popular sizes. Write for complete size list.

CHICAGO RAWHIDE MANUFACTURING COMPANY
1203 Elston Avenue Chicago 22, Illinois

Offices in 55 principal cities. See your telephone book.

In Canada: Distributed by Chicago Rawhide Mfg. Co. of Canada, Ltd., Brantford, Ontario

Export Sales: Geon International Corp., Great Neck, New York

SIRVIS C/R DIVISION
CHICAGO RAWHIDE

Other C/R Products

C/R Shaft & End Face Seals • Sirvene (synthetic rubber) molded pliable parts • C/R Non-metallic Gears

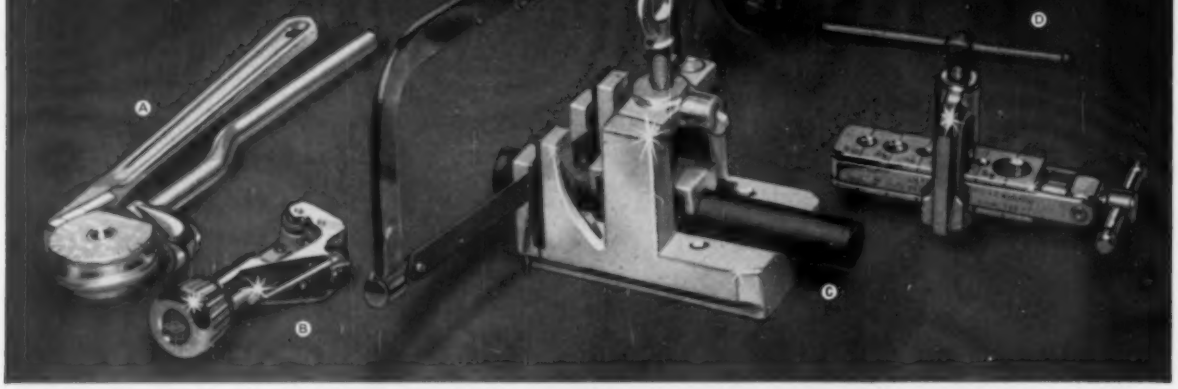
CIRCLE 23 ON READER SERVICE CARD

NEW TOOL DEVELOPMENTS BY IMPERIAL

BY-PASS OLD METHODS OF CUTTING, BENDING, AND FLARING TUBING

ALSO CUTTING WIRE BRAID HOSE.

URGE IMMEDIATE INVESTIGATION



Ⓐ **Bends hard or soft tubing.** Open side design. Forms neat, accurate bends, any angle up to 180°. Calibrated. Specify No. 364-FH "Blue Dot" bender. Sizes: ⅛ to ⅜" O.D. tubing. Individual benders for each size.

Ⓑ **Spare cutting wheel now included at no extra cost with this tube cutter!** Fits behind retractable reamer. Instantly available. Cutter has free-wheeling, ball-bearing action. No. 274-FA Hi-Duty tube cutter for ⅛ to 1⅛" O.D. tubing.

Ⓒ **For sawing wire-braid pressure hose or metal tubing.** Assures square, clean cuts. Minimum wear on hacksaw blade due to special gripper. Extra-tight slide-to-size clamping. For 3/16 to 1½" O.D. hose or tubing. No. 384-F bolts to bench or clamps in a vise.

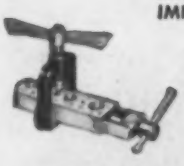
Ⓓ **Industrial hard chrome cones now furnished on Imperial flaring tools.** No extra cost! Smoother flares, up to 55% easier! Types for 45°, 37° and double flares. No. 300-F for 45° flares. No. 437-F for 37° flares. Sizes: 3/16, ¼, 5/16, ⅜, ½ and ⅝" O.D. tubing.

Imperial offers you industry's most complete line of tube working tools with more work-saving features!

If it's new . . . it's from Imperial! The complete tubing tool line with more "firsts" to its credit continues to take the "work" out of tube working with *more* new developments!

That means no matter what the tubing . . . copper, aluminum, steel or stainless steel . . . or the type of job, you're adding greater accuracy, speed, ease and better craftsmanship to cut costs right down the line. *Tool up with Imperial and be first with the latest!*

Avoid lost time and grief by replacing labor-wasting tools NOW with years-ahead IMPERIAL tubing tools. See your Imperial distributor now, or write for Catalog 3088.



No. 500-F and No. 507-F Rol-Air flaring tools for 45° and 37° flares.

No. 140-F Test plug — for closing end of tube temporarily. Pressures to 100 lbs.

No. 206-F — Adjust-o-matic, slide-to-size tube cutter. For ¾" to 2¼" O.D. Tubing.

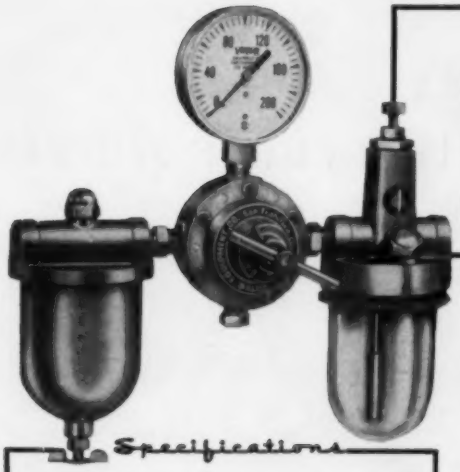
No. 400-F flares stainless steel, titanium — other metal tubing to AN standards.

No. 270-F Gear type bender bends any type of tubing.

No. 260-FH tube bender combination — hard or soft tubing. 7 sizes: ⅛ to ⅝" O.D.

THE IMPERIAL BRASS MFG. CO.
6300 W. Howard St., Chicago 31, Ill.
Dept. AH-68
In Canada: 18 Hock St., Toronto, Ontario

IMPERIAL — *Emblem of Quality*



PNEUMATIC CONTROLS BY VICTOR

FOR AIR-OPERATED TOOLS AND MACHINERY

FILTER Reliable operation of air equipment is dependent on removal of dirt, pipe scale and condensation from the air supply.

1. **A Porous Sintered Bronze** element provides maximum impurity trapping action with minimum air flow resistance (approximately 3 p.s.i. per 10 c.f.m.).
2. **Inlet Designed** to deflect the incoming air in a downward spiral motion to trap condensation and impurities which are removed through the petcock at the bottom of the bowl.
3. **Readily Disassembled** for complete cleaning by the removal of the top body nut.
4. **Available With Steel or Plastic Bowl.** Metal bowl is recommended for installations involving rough usage. The tough, durable plastic bowl is desirable because it provides full view of filtering action, showing condition of the air line and when to drain filter.

REGULATOR The VICTOR A-250 and A-375 Air Regulators are for reducing supply line pressures to required operating pressures and maintaining a constant pressure and flow of air to cylinders, pneumatic tools, and other types of air equipment.

1. **Self-Relieving Feature** protects equipment from over-pressure and permits relieving of delivery pressure by backing off the adjusting screw.
2. **Minimum Pressure Drop** is provided by a siphon port in the low pressure chamber which increases diaphragm response to delivery pressure demands.
3. **Freedom From Chatter** is made possible by a new design using a special "O" ring guide in the seat holder which effectively dampens out vibration under flow conditions.
4. **Simple, Sturdy Housing** of quality treated aluminum provides full strength and service without unnecessary weight. Internal parts are designed for simplicity and long life. Regulators laboratory tested millions of cycles, to insure trouble free operation under working conditions.
5. **Maximum Trouble-Free Diaphragm Life** is assured by the use of highest quality neoprene that will not separate or rupture.
6. **Trouble-Free Seat Life and Full Air Flow** is assured by an exclusive seat and nozzle design utilizing a precision moided half round neoprene seat against a flat face nozzle.
7. **Valve Seat Assembly Readily Accessible** for inspection by removing back plug.
8. **Sturdy Adjusting Screw** with smooth rolled threads, operates through a steel insert bushing. A lock-nut is provided for holding pressure settings. Adjusting screw can also be wire sealed through convenient tabs on bonnet to conform to JIC pneumatic standards.

LUBRICATOR The VICTOR Lubricator provides a dependable and accurate source of wear-protecting lubrication for all types of air equipment such as chucks, screw drivers, grinders, hoists, chipping hammers, air cylinders, etc.

1. **Visual Setting** of the lubrication rate results in correct oiling without guessing. The precision needle valve provides a wide range of accurate and consistent oil flow to the air line under operating conditions.
2. **Reliable Lubrication Rate.** The VICTOR Lubricator is designed to eliminate air locking and over feeding of oil into the line when the air flow stops or fluctuates. A filter in the oil feed line insures a constant flow of clean oil to the metering valve at all times.
3. **The Visual Oil Supply Cup** is made of a durable and tough plastic with a safety factor of 5 times the recommended maximum working pressure of 125 p.s.i. It has a 1/3 pint capacity.
4. **Oil Cup Easy to Fill.** Refilling can readily be accomplished through the filler plug without shutting off the air supply. The oil cup can be removed for cleaning or filling without shutting down the air supply, if the filler plug is removed before loosening the cup retaining nut.

Specifications

MODEL COMBINATIONS

	MODEL	WEIGHT
FRL	FRL-250	5 lb. 14 oz.
	FRL-375	5 lb. 14 oz.
	FRL-250P	5 lb. 14 oz.
	FRL-375P	5 lb. 14 oz.
FL	FL-250	3 lb.
	FL-375	3 lb.
	FL-250P	3 lb.
	FL-375P	3 lb.
F	F-250	1 lb. 7 oz.
	F-375	1 lb. 7 oz.
	F-250P	1 lb. 7 oz.
	F-375P	1 lb. 7 oz.
FR	FR-250	4 lb. 5 oz.
	FR-375	4 lb. 5 oz.
	FR-250P	4 lb. 5 oz.
	FR-375P	4 lb. 5 oz.
R	A-250	2 lb. 14 oz.
	A-375	2 lb. 14 oz.
RL	RL-250	4 lb. 7 oz.
	RL-375	4 lb. 7 oz.
L	L-250	1 lb. 9 oz.
	L-375	1 lb. 9 oz.

All 250 Models have ¼"-18 NPT(F) Inlet and Outlet Connections.

All 375 Models have ⅜"-18 NPT(F) Inlet and Outlet Connections.

NOTE:
All Filters, Regulators, and Lubricators listed have left hand inlets. If right hand inlet is desired, place "R" after the model number.

No. 44

VICTOR for welding

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

844 Folsom St., San Francisco 7 • 3821 Santa Fe Ave., Los Angeles 58

CIRCLE 124 ON READER SERVICE CARD

BRIEFS

FLUID POWER STOPPERS

During four hectic afternoons in April, engineers wandered through Chicago's sprawling International Amphitheatre studying, comparing, and discussing machine components at the Design Show. Mornings were taken up by the Design Conference of the ASME. As in all gatherings like this, Fluid Power was a big subject, both at the conference and the show.

With camera in hand, AH editors caught these displays showing how to use air and oil components.

WATCH THE LIGHTS! Neon signs on this Bellows display spell out the cylinder operations: Lift, Push, Hold, Turn, Pull.

AS THE EARTH TURNS, so does Rotherm Engineering's rotating joint with internal and external members. Here it connects air to five cylinders.

MRS. RUSS CAMERON lends charm to an example of Ross Operating Valve's 2-hand, palm-button valving on a press. Non-tie-down valve makes the pressman operate with both hands. Ross also displayed their new double stroke, indexing, momentary adaptor.

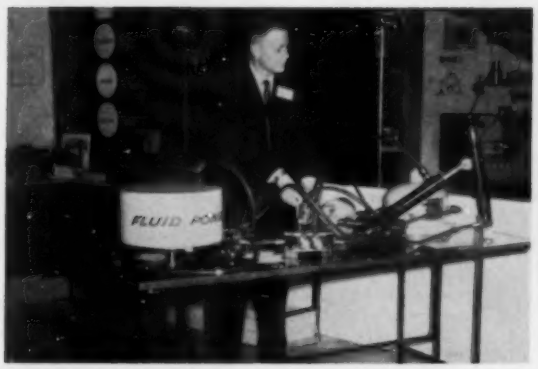
"HERE'S HOW IT'S SEALED," explains Mike Farrell, "professor" at Miller Fluid Power's College of Cylinder Knowledge. Miller stressed their cylinders with all-Teflon sealing.

VICKERS MADE UP a special stand to show uses of their new electro-hydraulic servo valve. Programmed speed, constant speed, and position control were among the systems set up. Other new products were a pressure compensated vane pump, temperature and pressure compensated flow control valve, and directional valve with oil-immersed solenoids.

AT CHICAGO DESIGN SHOW

A SUPER ERECTOR set helped Chicago Rawhide put across the myriad uses of their packings.

REPLICA OF THE VIBRATION and pulsation test for their captive nut fittings stopped visitors at the L&L Manufacturing exhibit. Actual tests show no leakage under vibration and surges to 5000 psi.



LIFT AND TILT could have been the operations illustrated by Commercial Shearing & Stamping's cylinder arrangement. Paul Farwell operates the system mock-up using a dual gear pump supplying the cylinders and a gear motor. Commercial also displayed their new 3000-psi vane pump.

WHAT HOLDS IT UP? Gast Manufacturing showed a small air compressor driving an air motor. Bleed-off air keeps the balloon bouncing in mid-air.

IT'S ALL IN THE DOOR! Jim Ergholt shows how a whole hydraulic system with Webster Electric's pump and relay unit fit into a door opener.

18,000 PSI reads the pressure gage on Parker-Hannifin's burst chamber. The tubing breaks, but the fittings hold every time.

Boost production . . .
cut fatigue with
Westinghouse Air Circuitry*

***Westinghouse Air Circuitry** is the application of pneumatic control to industrial production operations — a proven method of stepping up machinery output . . . increasing operator efficiency. These pneumatic devices are low in cost . . . easy to install . . . extremely accurate and reliable.

"H" CONTROLAIR® VALVES:
3- and 4-way directional valves—accurate pressure control in small increments—hand, foot, knob, or cam operation—maximum delivery pressure: 60, 100 psi—port sizes: ⅛" ips—maximum operating temperature: 200°F.

THREE-POSITION CYLINDERS:
noncushioned—3 stroke positions—foot and swivel mounted—2"-6" in diameter—maximum operating pressure: 250 psi.

MULTI-POSITION CYLINDERS:
noncushioned—4, 5, or 7 stroke—small diameter—tough, corrosion-resistant construction—maximum operating pressure: 250 psi.

Consult your nearest Westinghouse Air Brake Distributor. He's listed in the classified phone directory under "Cylinders: Air."

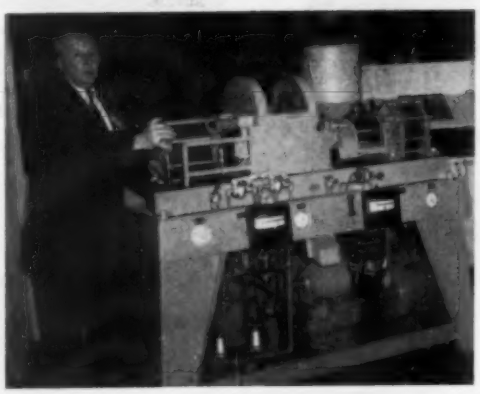
Westinghouse Air Brake
COMPANY
Industrial Products Division
WILMERDING PENNSYLVANIA

CIRCLE 129 ON READER SERVICE CARD

BRIEFS

ON-THE-JOB assembly of reusable hose ends was demonstrated with Aeroquip's portable machine. It's especially valuable to contractors, coal mine and oil well operators.

"MY BOY WOULD LOVE IT," remarked visitors at E. F. Houghton's display of a working model Hough Payloader. (See APPLIED HYDRAULICS Dec. '56 p. 86) The real thing uses Houghton packings.

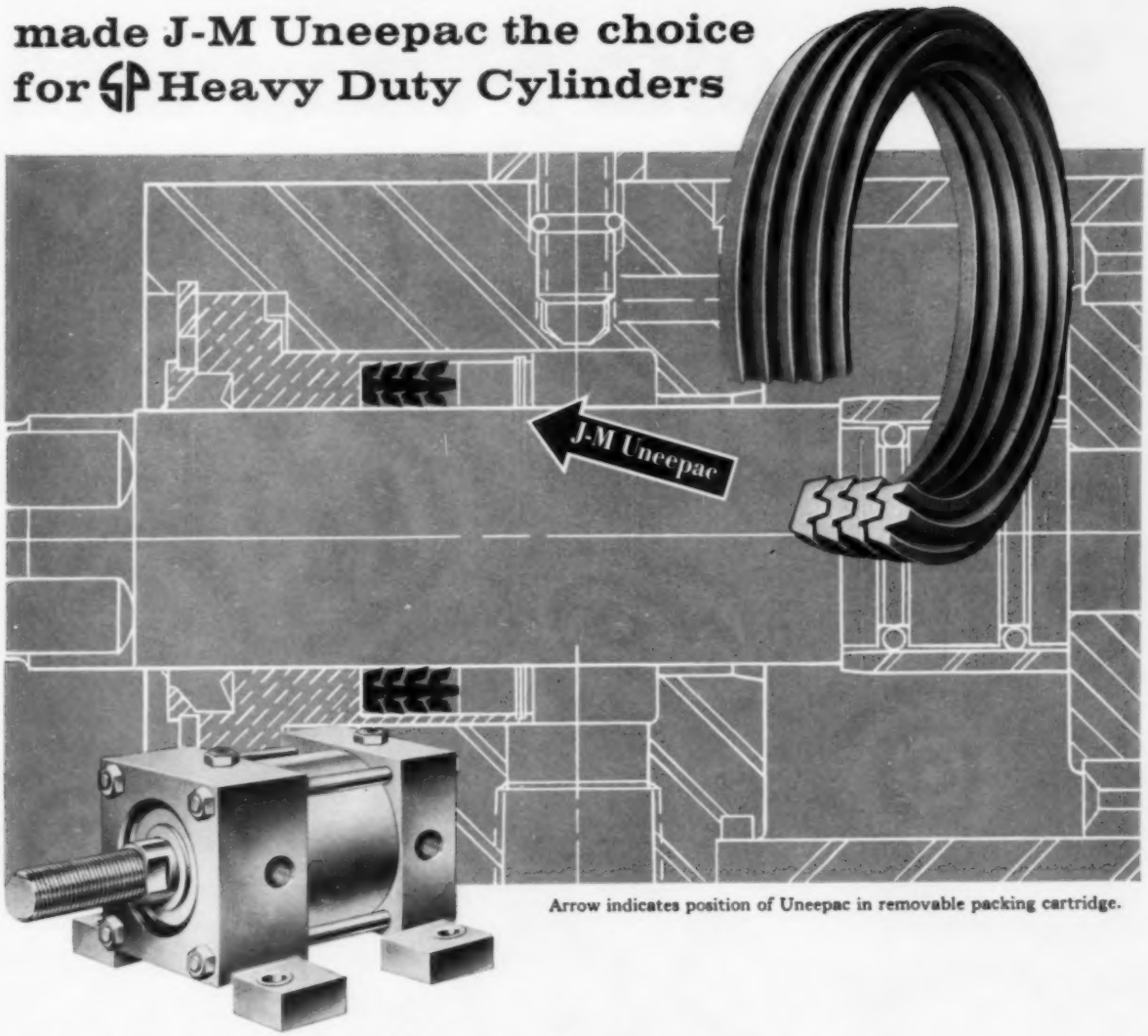


ALL-PNEUMATIC plastic molding press designed by A. Schrader's Son for molding their tire valve caps opens a new field for air components. Ed Reilly shows how it works.

YOU CAN CRIMP on a hose-end in 2 seconds with this new high speed crimper shown by Weatherhead. Air-operated, it takes hose to 3-inch.

Compactness . . .

made J-M Uneepac the choice for S-P Heavy Duty Cylinders



Arrow indicates position of Uneepac in removable packing cartridge.

Automatic ring packing helps solve design problem for the S-P Manufacturing Corporation of Solon, Ohio

THE INCREASING TREND toward automation in industrial processes has been made possible by the development of dependable service-free equipment like S-P Heavy Duty Cylinders. Among the design features which make S-P Cylinders so reliable are two Johns-Manville precision moulded packings.

J-M UNEEPAC® automatic ring packing provides maximum sealing in minimum space because each ring is a complete packing unit. This permits an overall reduction of the cylinder size and, in particular, enables S-P to include a quick-change removable packing cartridge. Uneepac is also self-adjusting—each ring positions itself automatically on adjoining rings. Friction is low because when assembled in sets, fluid pressure acts upon each lip individually. Lip section is also well supported to prevent distortion under pressure.

J-M U-CUPS are also used in the S-P Cylinder as piston head packing. They are precision-made for easy assembly, accurate fit, efficient sealing, reduced friction and long life.

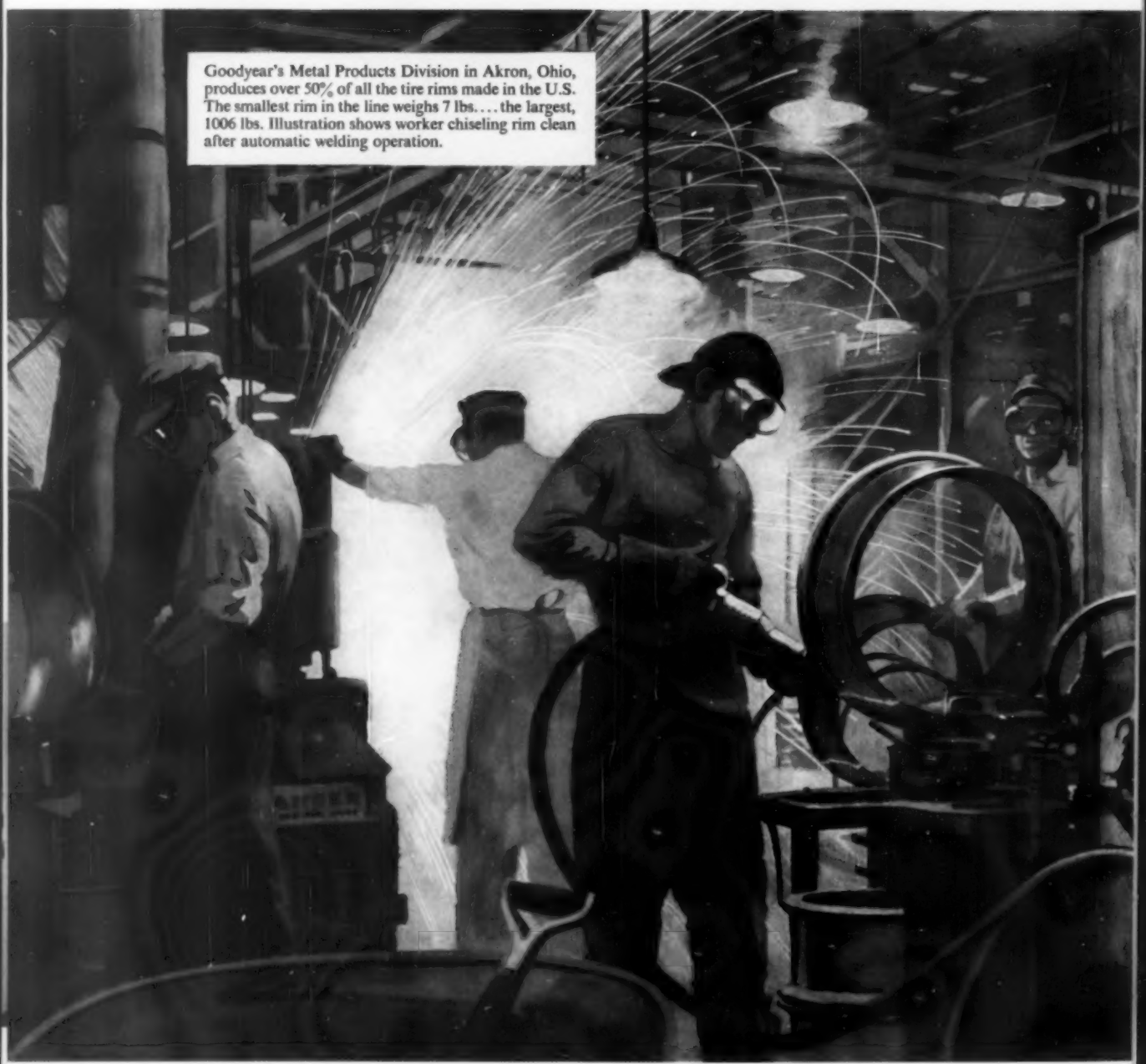
Uneepac and U-Cups are made in a variety of compositions for a wide range of hydraulic and pneumatic applications. For further information, write to Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

Correct Lubrication in Action...

Hydraulic Pump Life



Goodyear's Metal Products Division in Akron, Ohio, produces over 50% of all the tire rims made in the U.S. The smallest rim in the line weighs 7 lbs. . . . the largest, 1006 lbs. Illustration shows worker chiseling rim clean after automatic welding operation.

Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

Increased as much as 221%

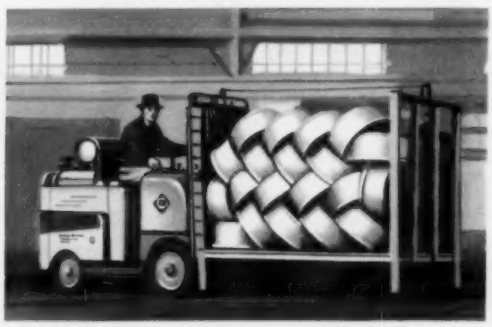
One of the ways Socony Mobil helped The Goodyear Tire and Rubber Company save over twice the cost of lubricants purchased in 1957

Nearly 100 pumps actuate the hydraulic presses and other equipment used to produce wheel rims at Goodyear's Metal Products Division. Under a Mobil program of Correct Lubrication some of these pumps have been in continuous service twice their expected life. Others with a normal plant service life of five years are still operating after *11 years*. This plant has never had a pump failure due to lubrication since the Mobil program began.

The fact that a pump failure, besides halting production, can cost up to $400 for labor and $3300 for other repairs underscores this record.

Here is another example of Correct Lubrication in Action. This cost-cutting Mobil Program gives you the benefit of complete engineering service throughout your plant . . . plus the benefits of Mobil's laboratory facilities . . . and 92 years of lubrication experience. It is turning maintenance costs into profits for The Goodyear Tire and Rubber Company. Why not for you?

$21,400 saved. Under the Mobil Program, Goodyear, to achieve maximum economy, purchases only the highest quality oils. Mobil engineers constantly check oil condition . . . advise when to reclaim. This assures minimum replacement with new oil.



$825 a year saved. Mobil engineers helped set up maintenance pattern for Goodyear's many stock handling trucks . . . made motor oil recommendation. Result—motor overhaul period extended from every three months to every four years.

$6,000 a year saved. High temperatures in paint drying ovens caused stoppage of conveyor system . . . cost $500 a month in labor and materials. Mobil recommendation of special grease eliminated breakdowns.

Total 1957 savings—2.7 times purchase price of oils and greases. Through close cooperation between company personnel and Mobil engineers, maintenance costs are held to a minimum...oils deliver maximum life.

Correct Lubrication

Another reason You're Miles Ahead with Mobil!

FIGHT "Dirty-Oil DOWNTIME"

with NEW CFC Honan-Crane K-type FILTER

Dirty oil — the major cause of trouble in hydraulic systems — can be eliminated with the new CFC Honan-Crane K-Type Filter. Developed especially to meet JIC standards, the new filter employs two types of interchangeable cartridges for micro-clarity of all kinds of mineral oil and synthetics.

The Flo-Pac 5 resin-impregnated paper cartridge keeps hydraulic fluids clean at all times. It will not remove additives. Tough, pleated paper provides over 6300 inches of filtering surface. It is designed for high flow rates, full-flow or by-pass filtration, water-base and additive hydraulic fluids.

The K-Type Cartridge, containing 13 pounds of Type "T" Cranite (fuller's earth), removes water, acids and asphaltenes as well as solid contaminants. Cranite is packed solidly in a metal container. K-Type Cartridge is recommended for non-additive type oils and certain synthetics.

Internal pressure valve is set at 50 psi. Bracket allows for base mounting or mounting on side of machine.

For technical literature and prices, write to Department AH

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

MICRO-CLARITY AT MINIMUM COST

Fulflo FILTERS — *with genuine Honeycomb Filter Tubes for controlled micro-clarity of industrial fluids.*

CFC FILTERS — *Selective filtration of oils • water-oil separators • magnetic separators • pre-coat filters • coolant clarifiers • automatic tubular conveyors.*

BRIEFS

Spears Help Refine Oil

Condenser tubes in refineries and chemical plants can now be pulled with the help of a hydraulic tube puller. Tapered spears are threaded into the tubes with an impact wrench. The hydraulic

tube puller is secured to the spear by means of grooves milled in the spear. A hand pump supplies hydraulic pressure to pull the tube from the tube sheet. This method, developed by William S Pine Co., Los Angeles, Calif., is more efficient than previous mechanical methods. ▼▼▼

Electro-Hydraulic Feed Increases Production

Speed and accuracy is increased over 100% by using an

electro-hydraulic feed on the critical milling operations of an automatic contour milling machine. One milling head on this machine has four distinct motions con-

Continued on next page

Get more production—at lower cost with

Quick-As-Wink®
AIR AND HYDRAULIC
Control Valves

½" Single Solenoid Two Position 4-way "B"-type Valve, for Pressures up to 250 psi.

¼" 4-way Cam Operated Spring Return Valve, for Pressures up to 125 psi.

½" 2 Pedal Foot Operated 4-way Valve, for Pressures up to 200 psi.

1" Pilot Cylinder Operated 4-way Two Position Hydraulic Valve, for Pressures up to 5000 psi.

Cut your costs—and increase your production—by installing Quick-As-Wink Control Valves **throughout your plant.** Proven in service, our exclusive, patented* construction assures year after year of long, efficient, dependable **and low cost operation.** Production and maintenance men know Quick-As-Wink Valves are unsurpassed. Can you afford to gamble with less? Hundreds of different types, actions and sizes from ¼" to 4". Get full details.

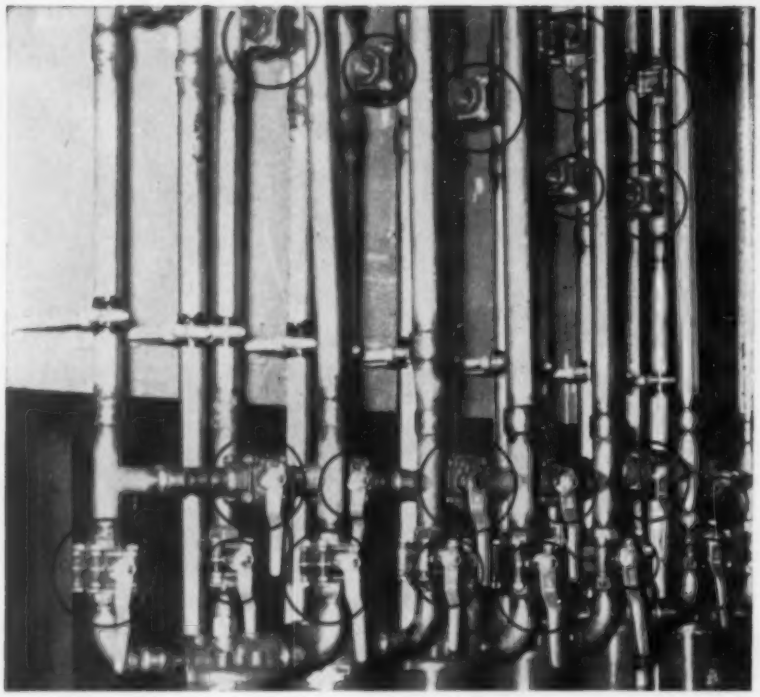
*U. S. Patent No. 2,645,450

Write for **BULLETIN NO. 571** *Today.*

Quick-As-Wink®
AIR AND HYDRAULIC
Control Valves

***Mfd. by* C. B. HUNT & SON, INC., 1993 East Pershing St., Salem, Ohio**

— Engineering and Sales Representatives in the Principal Cities —



Only the ECON-O-"MISER" Ball Valve was able to solve this problem for PathéColor, Inc.

THE PROBLEM: To find a valve that would meet all of the following requirements:

1. Quick visual indication of position and quarter turn operation. 2. Excellent flow characteristics and positive shut-off. 3. The advantages of flange construction without the bulk and weight of conventional flanged valves. 4. Easy & quick disassembling for low cost maintenance. 5. The most compact and economical installation of Type 316 stainless steel valves possible.

SOLUTION: *Specifying* and *installing* Worcester's Econ-o-"miser" Ball Valve. In so doing PathéColor found a valve that provides a positive seal, a flanged construction much more compact than conventional valves that could be socket welded. In addition many unions and companion flanges were eliminated with the overall result that savings on this installation alone amounted to many hundreds of dollars.

Valves available, ¼"-2", in following standard materials*: Bronze, Aluminum Bronze, Aluminum, Carbon Steel and Types 303 and 316 Stainless Steel. Standard Seat and O-Ring materials*: Buna-N, Neoprene, and Teflon.

**Other materials available on request.*

For further information and descriptive literature write to:

WORCESTER VALVE CO., INC.

16 PARKER STREET • WORCESTER, MASS.

CIRCLE 130 ON READER SERVICE CARD

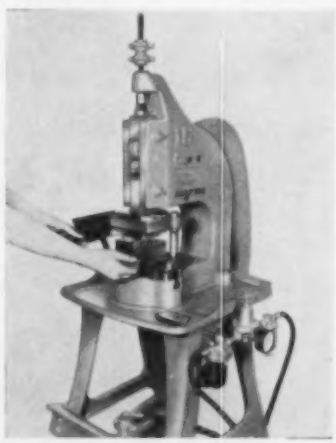
BRIEFS

sisting of longitudinal, transverse, angular, and vertical. These motions are all controlled through remote selsyn electronic tracer systems. For this particular head the vertical feed is critical, so here electro-hydraulic drive is applied. This drive controls all transient and velocity errors.

The machine, built by Onsrud Machine Works Inc., Niles, Ill., provides a resolution accuracy to a tolerance of .0005 in. and a part-to-part reproducable accuracy to a tolerance of .0015 in. This tolerance is held at a feed rate of 60 in. per min on a radius of ½ in. ▼▼▼

Air Puts A Kick Press To Work

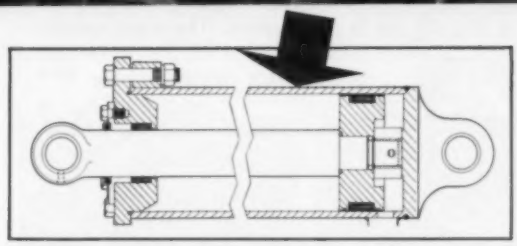
By adding an air cylinder and a foot control valve this kick press is now able to emboss and blank aluminum, tin, zinc, copper, and



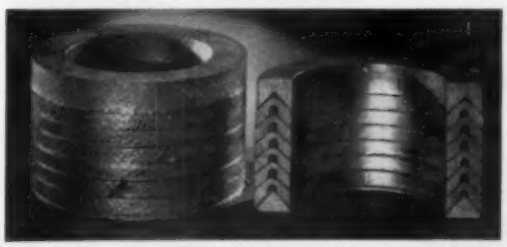
stainless steel. The cylinder, mounted horizontally in the base of the press, drives the platen through a lever arrangement designed to increase the cylinder force. Made by the Acromark Co., Elizabeth, N. J., the press has an overall height of 64 in and requires a floor space of 22 in by 28 in. A minimum air pressure of 75 psi is required for operation. ▼▼▼

Continued on page 40

CIRCLE 44 →



Drawing shows Garlock CHEVRON Packings on rod and piston of hydraulic cylinder made by Clark Equipment Company, Construction Machinery Division, Benton Harbor, Michigan. Note spool type piston made possible by use of cut open CHEVRON rings.



Typical CHEVRON Packing Set and cross section. Unique design provides automatic sealing action under all pressures . . . permits use of less packing in shallower stuffing boxes.

CHEVRON* Packings help simplify cylinder design and maintenance for CLARK

Garlock rod and piston packings on Clark's Michigan Tractor shovels are designed to give long trouble-free service and permit easy replacement. At the same time, Clark engineers have reduced manufacturing costs and simplified the piston design through use of Garlock cut open CHEVRON rings on a spool type piston. The packings operate against pressures to 1500 psi and temperatures to 180° F. Mr. M. L. Conrad, Director of Engineering for this Clark Division reports, "We have used Garlock CHEVRON rod and piston packings on this Tractor Shovel since it was first designed four years ago. The results have certainly justified such standardization."

CHEVRON is available for your application in sizes for practically any rod or stuffing box. It is another member of "the Garlock 2,000" . . . two thousand different styles of packings, gaskets, and seals for every need. The only complete line. That's why you get unbiased recommendations from your Garlock representative. Call him or write for CHEVRON Folder AD-115.

*Registered Trademark

THE GARLOCK PACKING COMPANY, Palmyra, New York

For Prompt Service, contact one of our 30 sales offices and warehouses throughout the U.S. and Canada.

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products

FULFLO

piston-type
oil relief
by-pass valves
for O.E.M. or
replacement

Best Buy because

QUICK DELIVERY

Fulflo stocking policy *and* practice permits quick shipment from stock of most standard types. Shipment is usually made *within 24 hours.*

TECHNICAL SERVICE

Fulflo engineers are ready *and* able to help you with any valve problem. Modified standard or special valves can be provided for any need.

WIDE RANGE OF TYPES AND SIZES

- Standard and flanged models
- Just 6 springs for pressures to 500#
- Wide range of brass, cast iron or steel bodies . . . brass, steel or stainless pistons
- Pipe sizes to 3″
- SPECIALS to your requirements

Write for "Fulflo Valves Mechanical Data Book"

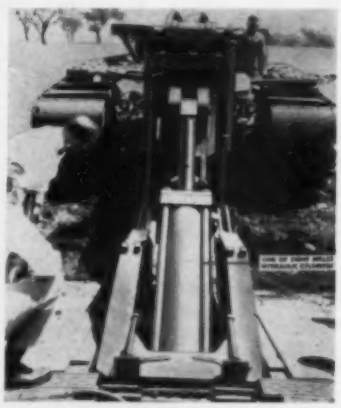
FULFLO

THE FULFLO SPECIALTIES CO., INC.
415 FANCY AVENUE • BLANCHESTER, OHIO

BRIEFS

Hydraulic Cylinders Used To Lay Bridge

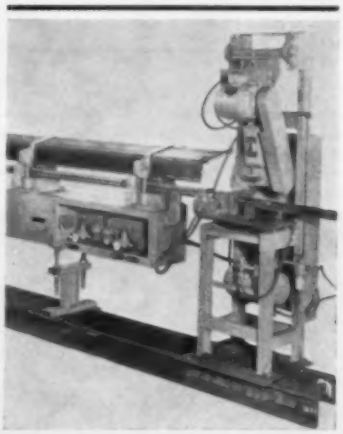
A tank mounted bridge launcher recently built for the Army Corps of Engineers uses a total of 8 cylinders. The cylinders, which range in size from 3¼ to 12 inches in diameter are used to unfold



Courtesy Miller Fluid Power Division

the bridge and to project it over the channel to be spanned. The cylinder used to project the bridge is 8 feet long. The same mechanism is used to lift the bridge and place it back on the launcher. ▼▼▼

Continued on page 44



AUTOMATICALLY FED swing cut-off machine uses an air cylinder to clamp the work. Clamping is done as the operater swings the cutting head into the work. This prevents any cutting before the work is securely clamped. Machine designed by Wallace Supplies Mfg. Co., Chicago, Ill., has capacity to 1.9 in dia tube or pipe.

the ultimate in air cylinder power-

BUILT-IN ELECTRICALLY-CONTROLLED DIRECTIONAL VALVE

BUILT-IN DUAL SPEED CONTROLS

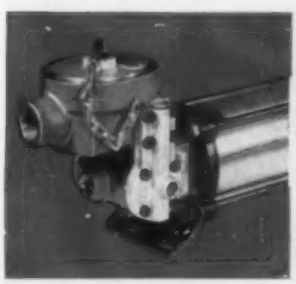
REQUIRES ONLY A SINGLE AIR CONNECTION

THE BELLOWS AIR MOTOR

The Bellows Air Motor is a complete air cylinder power unit, with directional valve and speed controls built-in. Takes less than half the space and costs less installed than a conventional air cylinder set-up of equal power with its separate valving and piping. The single air connection, which can be made with flexible hose, makes it ideal for use on moving machine elements. It is a sturdy unit with forged steel heads, heavy brass cylinder, stainless steel piston rod. The piston rod is threaded, equipped with a wrench flat and nut. Many Bellows Air Motors have been operating day in and day out for fifteen years with negligible maintenance. And if service needs do arise, there is a Bellows Field engineer as near as your phone.

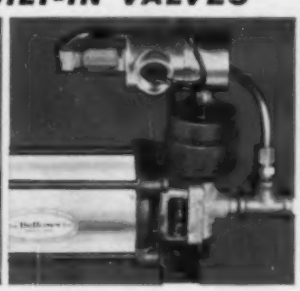
The Bellows Air Motor shown above is a 2½" bore unit equipped with the Bellows Low-Voltage (8-12V) Electroaire Valve. Other bores available are 1¼", 1¾", 3⅝" and 4½". Any stroke length. Optional choice of built-in valves as shown below.

CHOICE OF BUILT-IN VALVES

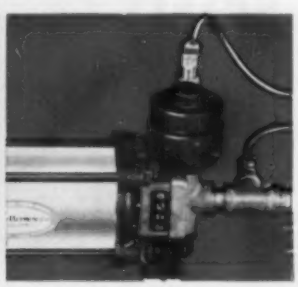


115 V. ELECTROAIRE VALVE
For J.I.C. applications where a 115 v. momentary contact is desirable.

MECHANICAL VALVE
For manual operation or for use with cams or direct linkage.



115 V. MAINTAINED CONTACT
Valve remains in shifted position during period current is applied.



AIR-OPERATED
For use in applications calling for full pneumatic control.

Write for these two booklets

Fifty pages of data to help you select the right Air Motor-Valve combination for your job. Address Dept. AH-658 The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto 18. Ask for Bulletins BM-25 and SP-55.

The Bellows Co.

DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

AKRON 9, OHIO

983-B

CIRCLE 16 ON READER SERVICE CARD

PROOF
OF EXTRA
SAFETY...

ONLY GREER ACCUMULATORS MEET ALL SAFETY CODES!

Qualify for any type hydraulic installation under all safety ordinances everywhere because . . . they're

BURST-PROOF!

Design engineers using hydraulic accumulators on machines and equipment in interstate commerce must be aware of stringent nation-wide safety regulations. For guaranteed acceptance everywhere, specify the Greer Accumulator — the only accumulator that meets all safety codes. More than 81,000 Greer Accumulators are now in use in every state of the union and in almost every industry. These exclusive built in safety features tell you why:

AIR VALVE Absolutely leak-proof for pressures up to 12,000 psi. Integrally molded one-piece valve stem prevents gas loss.

SHELL No seams. No welds. No joints. Made of single-piece homogenous chrome molybdenum steel. 18% elongation in two inches guarantees against metal fatigue. 5 to 1 safety margin above maximum working pressure of the accumulator.

MOUTH Designed to yield at 400% of maximum working pressure. This safety feature releases pressure if relief valve clogs or sticks, or if system is blocked.

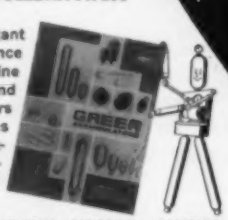
PLUG ASSEMBLY Accumulator cannot be disassembled until complete gas charge in bag has been released. Lack of this safety feature has caused serious accidents. Be sure to check this protection.

Greer Accumulators meet all J.I.C. and I.C.C. safety standards including the strict Penn. Boiler code, and conform with all municipal, state and insurance underwriters safety codes in accordance with ASME specifications on unfired pressure vessels.

Learn more about Greer Accumulators and how they can cut costs on your hydraulic equipment. Contact the franchised Greer distributor in Buffalo, Cleveland, Houston, Philadelphia and Pittsburgh. Inquiries invited from distributors in other areas.

WRITE OR PHONE FOR GREER BULLETIN PR-300

An important catalog reference on the complete line of Greer standard and special accumulators with circuit diagrams and applications. Also details on hydraulic components made by Greer such as valves, filters, actuators, etc.



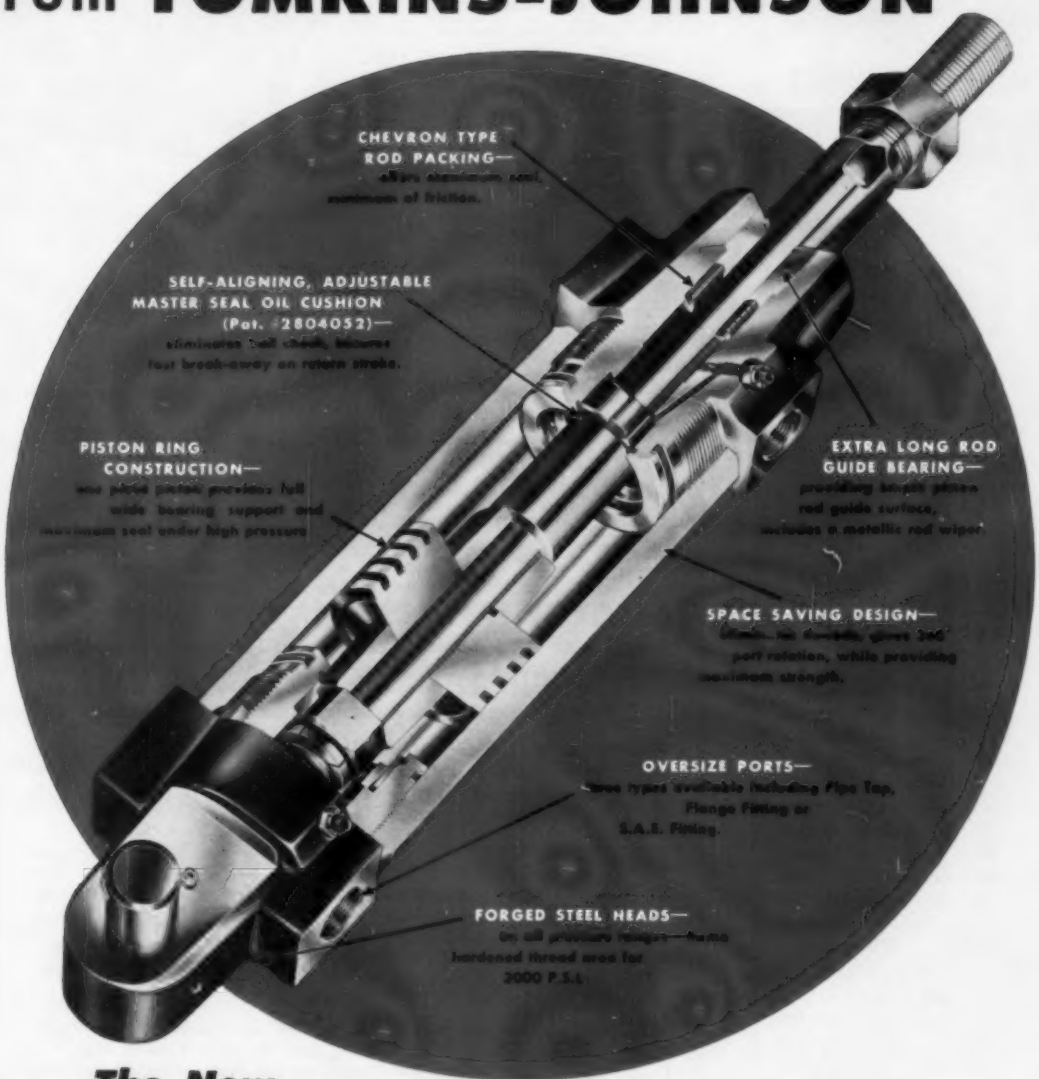
U. S. PATENTS UNDER GREER LICENSES

GREER HYDRAULICS INC. • INTERNATIONAL AIRPORT • JAMAICA 30, NEW YORK

Manufacturers of Precision Test Equipment and Hydraulic Components

Another Engineering First

from TOMKINS-JOHNSON



The New

T-J Spacemaker

HIGH PRESSURE HYDRAULIC CYLINDER

1000
● 2000 P.S.I. Operating Pressure
3000

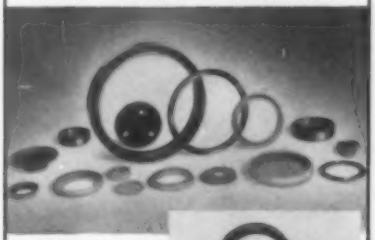
Truly another engineering first from Tomkins-Johnson, the new T-J Spacemaker High Pressure Hydraulic Cylinder will provide quality power performance at high operating pressures. ONLY T-J OFFERS YOU A HYDRAULIC CYLINDER WITH ALL THESE EXTRAS—*STANDARD,* AT NO EXTRA COST. Write to The Tomkins-Johnson Company, 617 N. Mechanic Street, Jackson, Michigan, for further details and Bulletin No. HSM-5-58.

T-J TOMKINS-JOHNSON

For Efficiency & Long Life

GRATON AND KNIGHT®

MECHANICAL PACKINGS



LEATHER

SYNTHETIC

"O" RINGS

CUP

FLANGE

"U"

"V"

WASHERS

"O" RINGS

Looking for packings that have proven their ability to withstand high pressures and severe operating conditions? G&K offers you just such packings in their complete line of leather, synthetic and "O" rings. You can be sure that the packings G&K engineers recommend will do the job better and last longer.

Remember G&K . . . world's largest manufacturer of industrial leathers were pioneers in the manufacture of mechanical leather packings and are equipped to solve your packing problems . . . For service and quality you can count on G&K.

Write today for detailed information on G&K packings

GRATON & KNIGHT Company Inc.

WORCESTER 4, MASSACHUSETTS

CIRCLE 48 ON READER SERVICE CARD

BRIEFS

Air Helps Make Pill Boxes

Small foil containers similar to those in which you receive pills are stamped out, filled, and sealed on this automatic machine. Designed by J. B. Morrison Machinery Co., Ltd., Toronto, Canada, the machine uses standard components and is completely air operated.

• **Operation**—Two single acting cylinders are mounted above the rotary work feeder. A roll of aluminum foil at the right is fed through the dies by a pair of rollers at the left, which are turned by an adjustable stroke cylinder. The stroke of this cylinder is regulated to not waste foil.

At the loading station, the operator places the product to be

packaged between the two covers. The machine then indexes and the container is sealed by the air cylinder at the left.

The timer, master valves, filter, regulator, and lubricator are mounted on the stand that supports the pressing cylinders. ▼▼▼

Continued on page 46

BRIEF NOTES

HARD COATED ALUMINUM . . . for valve bodies and spools is being used in a new packless design by Alkon Products Co. Spools are ground and bodies are honed for selective fitting. Tolerances measured in millionths of an inch are held. Direct solenoid operation on sizes to ½ in is possible because of the low friction load.

CHALLENGE OF A GROWTH ERA . . .is the theme of a new corporate booklet issued by Parker-Hannifin Corp. Here's a picture of growth in hydraulics and pneumatics. During the past 10 years Parker-Hannifin sales have shown more than five-fold increase.

ENGINEERING ENROLLMENT HIGHER . . . was reported by the American Society for Engineering Education. The survey covered 152 colleges and indicated that in the fall of 1957 there was an increase of 5.5% enrollment over the previous high in 1947.

SILICONE RUBBER . . . which resists compression set at 500 deg F has been developed by Dow Corning Corp., Midland, Mich. The stock is now being produced in a pilot plant. Tests show only 45% compression set after 22 hours at 480 deg F. Regular silicone rubber exhibits 100% compression set under these conditions.

BUSINESS BRIEFS

MERGER . . . Two well known electric motor manufacturers, Howell Electric Motors Co., Howell, Mich., and The Ohio Electric Mfg., Co., Cleveland, Ohio, are conducting merger negotiations. If approved, the merger will form a new company with combined annual sales in excess of $12 million.

EARNINGS UP 55% . . . in 1957 over 1956 was reported by Purolator Products, Inc., Rahway, N. J. Net earnings for 1957 were $1,505,535 as compared to $972,241 in 1956. "We haven't got a schedule worked out, but we should be able to expand industrial sales from practically nothing to 10 to 20% of our total volume within a year or so," one official stated.

GENERAL ELECTRIC COMPANY . . . continued its pattern of postwar growth in sales and earnings. An all-time record was set in 1957 when the company net profit was $247,851,871 on total sales of $4,355,664,061. It's an increase in net earnings over 1956 of 16 per cent.

CIRCLE 78 ⟶

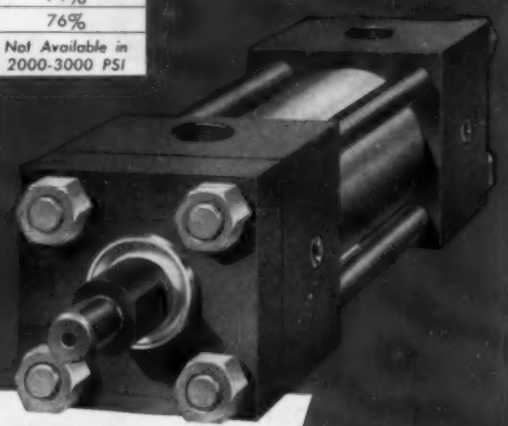
Save 27% or more in cost...

NEW Miller "JOB RATED" HYDRAULIC CYLINDER LINE

JOB RATED, MODEL " J "

BORE	SEVERE OPERATING CONDITIONS	MODERATE OPERATING CONDITIONS	YOU SAVE THIS % IN PRICE OVER STANDARD 2000-3000 PSI CYLINDERS
1½"	1500 PSI	2500 PSI	27%
2	1500	2500	27%
2½	1000	1500	28%
3¼	1500	2500	32%
4	1000	1500	35%
5	800	1200	37%
6	800	1200	43%
8	500	800	50%
10	500	800	71%
12	500	800	76%
14	500	800	*Not Available in 2000-3000 PSI*

with IDENTICAL seals, design, and safety factors as the famous Miller "Power-Packed" Model "H" Line for 3000-5000 psi service.



SEAL FAILURE MEANS CYLINDER FAILURE!

1. *No seal made of synthetic rubber is compatible with even 50% of available, commercial, petroleum base hydraulic fluids.*

MILLER Uses All Teflon* Seals to Eliminate External Oil Leakage because Teflon is impervious to all known hydraulic fluids, even fire-resistant types.

TEFLON SHEF SEAL At Tubing Ends

No blind assembly. Is
Shear-proof
Heat-proof
Extrusion-proof
Fluid-proof

TEFLON Seals On Piston Rod And Bushing

Teflon rod flange seal requires no adjustment. Teflon bushing seal is shearproof. Teflon wiper keeps dirt out.

TEFLON Seals On Ball Check And Adjusting Screw

Non-protruding, self-locking, cushion adjusting screw interchangeable with ball check for easy access.

MILLER Uses Resin-Impregnated Leather Piston Cup Seals because they are compatible with petroleum base fluids and some fire-resistant types. Teflon cups available at small extra cost.

2. *Nicked or scored piston rods cause seal failure*

MILLER Uses Case-Hardened Chrome-Plated Piston Rods because they prevent nicks, scoring and rust.

write for new bulletin giving complete details plus valuable data on column strength, cylinder forces, pipe sizes, safety factors, acceleration, air-oil devices, and other useful information.

NOW! . . . You can save MORE with quality Miller "Job-Rated" Cylinders than with cut-price, lesser quality hydraulic cylinders. And the "Job-Rated" Cylinders are also available under the same immediate shipment program as the Power-Packed Line (2 hours if necessary—3 days normal).

* Trade designation for tetrafluoroethylene resin which withstands temperatures from −100° F. to +500° F. and all hydraulic fluids.

OTHER MILLER QUALITY FEATURES

- Rust-Resistant Surfaces
- Interchangeable, Space-Saving Square, 4-Tie-Rod Design
- Precision Honed Barrels

MILLER FLUID POWER

CYLINDER OF HIGH PRESSURE OPERATION

2008 N. Hawthorne Ave. Melrose Park, Ill.

AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS

Your Tight Specifications Require the Tightest Seal!

MARSH IMPREGNATED THERMO-LEATHER PACKINGS

58 years of packing experience and extensive research *plus* development of the finest synthetic impregnations gives assurance of satisfaction in your specific packing requirements.

- Low coefficient of friction
- Greater wear resistance
- Tighter sealing
- Temperature stability

LEATHER . . . For the Best Seal

Field experience is constantly proving the leather packing impregnated to fluid conditions is superior to other materials—the one seal which will conform in operation to its housing—creating immediate and continual sealing with each pressure application!!

Engineering and Consulting Service

If you seal oil, water, air, vacuum, gas, gasoline, naptha, alcohol or other fluids, ask MARSH for field engineering service, immediately available to you for the job you are designing, tooling, manufacturing.

MARSH BEST SINCE 1900 LEATHER PACKINGS

C. W. MARSH COMPANY

MAIN OFFICE AND FACTORY • MUSKEGON, MICHIGAN

SALES OFFICES: 73 E. Wacker Drive, Chicago 1, Illinois · 101 Park Avenue, New York 17, New York · 1900 Euclid Avenue, Cleveland 15, Ohio

BRIEFS

Power Steering Uses Torque Amplifier

Conrad R. Himmler, technical director, Centre de recherches Hydraulics et Electriques, Paris, France, recently described a new power steering system. A rotating valve is placed between the steering wheel and the mechanical steering system. Valve is a balanced-differential rotating type.

Steering motor is a radial piston multiple cam type. To reduce weight the motor has 8 cam elevations per rev. The motor gets reaction and feedback by the rotation of a sleeve which incorporates the valve orifices. The sleeve is positioned by the motor so that, when the motor position corresponds to the position of the valve, valve orifices are closed to hold the motor in that position. Motor has 15 mkg torque at 800 psi and 200 cu cm displacement per revolution.

SPECIAL ATTACHMENT to handle U. S. Rubber Sealdbin flowable solids containers was designed by The Yale & Towne Mfg. Co., Philadelphia, Pa. The containers are lifted and tilted hydraulically and a hydraulic power operated winch built in to the attachment is used to pick up collapsed, empty containers from ground level or off a rail car or truck bed.

It can be mounted between steering wheel and mechanical linkage without modifying present system. If hydraulic pressure fails, direct steering takes over. ▼▼▼

Continued on page 49

NEW
from
DENISON

4-WAY VALVE

Pilot-operated, solenoid-controlled for hydraulic systems up to 3000 psi

SHOCKLESS CONTROL is assured with Denison's new line of 4-Way Valves for any directional control requirement.

Designed to provide directional control of oil flow up to 30 gpm—pressures up to 3000 psi, and all porting and positioning combinations—these new valves offer exceptional design versatility to Hydraulic Engineers because:

1. They meet all JIC requirements.
2. Over-all length is shorter than any other comparable valve.
3. Shortest solenoid power stroke increases operative force.
4. Special built-in check provides pilot pressure without adding another valve to the system.
5. No bulky, external chains to catch on equipment or personnel. Rugged, drawn-steel solenoid covers are secured to body with internal retaining cords.
6. Oil-enclosed solenoids are available.
7. Direct current operation also available.
8. Interchangeable parts simplify service and model changes in the field.

DESIGNERS ENGINEERS!

Send for Bulletins VD-7 and VD-8

for full details write

DENISON ENGINEERING DIVISION
American Brake Shoe Co.
1166 Dublin Road • Columbus 16, Ohio

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

Denison and Denison HydrOILics are registered trademarks of Denison Eng. Div., ABSCO

DENISON HydrOILics

1958 FLUID POWER PRIZE PAPER CONTEST

CONTEST CLOSES JULY 1, 1958

First Prize $500

Second Prize $300

Third Prize $200

4th to 7th Prizes, each . $50

CONTEST RULES

PURPOSE: The purpose of this competition is to recognize and reward achievement in the field of fluid power design and application.

SUBJECT OF ENTRIES: Papers can deal with any phase of product or equipment development in the fluid power field; descriptions of new applications of hydraulics and pneumatics; efficient maintenance and trouble shooting programs; construction techniques used on fluid powered machines; production and automation improvement obtained by use of fluid power; circuit improvements; machine conversions.

All papers must be original and expressly prepared for entry in this contest.

Papers may be co-authored.

Where required, company clearance for publication must be obtained by the author before submitting the paper.

WHO MAY ENTER: All readers of APPLIED HYDRAULICS Magazine whose work has helped to promote the advancement of hydraulics or pneumatics are eligible.

CRITERIA FOR AWARDS: Judges will evaluate papers on the basis of practicality, economics, originality, and presentation for publication.

HOW TO ENTER: Papers must be typed, double-spaced, on 8½ x 11 sheets. Inclusion of glossy photographs is recommended along with pertinent circuit, layout, and component drawings.

Drawings should be prints or photostats.

Where applicable, tables, charts and graphs should be included.

Papers must be submitted in duplicate.

On the title sheet for each entry, author's name, position, company and address must appear.

There is no limit to length of article. Any issue of APPLIED HYDRAULICS will serve as a guide to presentation.

Submit all entries to:

Editor
APPLIED HYDRAULICS Magazine
812 Huron Road
Cleveland 15, Ohio

PRESENTATION OF PRIZES: As in past years, arrangements will be made to present cash awards to the three top winners at a luncheon meeting of the National Conference on Industrial Hydraulics in the Fall of 1958. The three top papers will be published in the APPLIED HYDRAULICS Conference Issue, October 1958.

STATUS OF SUBMITTED PAPERS: All papers winning cash prizes and awarded honorable mention become the property of APPLIED HYDRAULICS Magazine to be scheduled for publication by its editors. After publication, permission for reprinting or presentation before technical groups will be granted.

All entries will be acknowledged.

CLOSING DATE: July 1, 1958

APPLIED HYDRAULICS

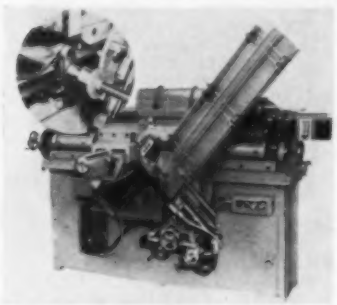
THE MAGAZINE OF FLUID POWER

812 Huron Road • Cleveland 15, Ohio

BRIEFS

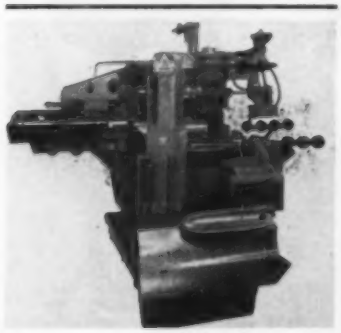
Hydraulic Shell Trimmer

Up to 800 shells per hour can be trimmed with this fully automatic shell trimmer. The machine is all hydraulically operated except for the air ejector and feeder. The machine uses a sliding knife which is fed to a rotating



spindle holding the shell. A slicing rather than shearing action permits trimming with less force. As the shell is loaded automatically into the machine, it breaks a photo-electric beam which sets the cycle in operation. The cycle includes trimming and ejecting the shell and cutting and ejecting the scrap. A 15 hp motor drives the machine and its 22 gpm, variable volume, pressure compensated pump. Trimmer is manufactured by Dayton Rogers Mfg. Co., Minneapolis, Minn. ▼▼▼

Continued on page 52

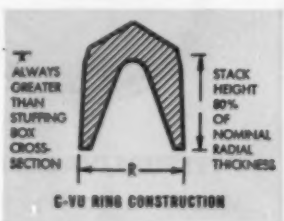


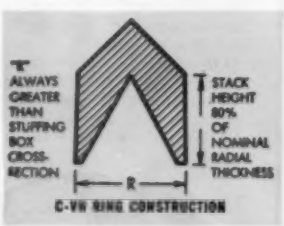
Air actuated stop fingers accurately position parts for crimping. After this hemming operation is completed, an air cylinder ejects the part. Pneumatic operation was chosen by Delta Welder Corp., Detroit, to save space and speed production.

Countless successful applications of C-V Rings under the most severe service conditions have made this the closest approach to a universal packing.

It will effectively handle all industrial acids, alkalis, solvents, organic and hydraulic fluids . . . temperatures from −120°F. to +500°F. . . . is equally suited to valves, pumps, mixers, hydraulic cylinders and like equipment.

"John Crane" C-V Rings have extremely low coefficient of friction. "Breakout" friction is only slightly higher than running friction.





TWO STYLES ARE AVAILABLE:

C-VU RINGS *for low pressure service* —such as control and regulator valves handling gases and fluids, where it is necessary to have a very sensitive and resilient type packing.

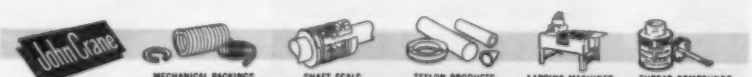
C-VH RINGS *for high pressure service* —for use in pumps, hydraulic cylinders and like services at pressures ranging to 500 psi. and over. These rings are constructed with a heavy wall heel to withstand pressure requirements. They are designed to provide voids between rings, so that as the Teflon expands due to heat, this take-up room minimizes any excess friction in the stuffing box.

"John Crane" C-V Rings are available in full line of standard sizes and male and female adaptors. Sizes can be molded to stuffing box specifications.

Request Bulletin P-325

*"John Crane" C-V Rings are made from Chemlon—*the best in DuPont Teflon.*

Crane Packing Co., 6405 Oakton St., Morton Grove, Ill. (Chicago Suburb). *In Canada: Crane Packing Co., Ltd., Hamilton, Ont.*



CRANE PACKING COMPANY

RMC Instruments for Hydraulic Pressure Systems

Tell us your requirements for indicating instruments or actuating switches and let RMC engineering skill go to work for you.

ROCHESTER
MANUFACTURING CO., INC.
209 ROCKWOOD ST.
ROCHESTER 10, N. Y.

RMC
LIQUID LEVEL, TEMPERATURE and PRESSURE INSTRUMENTS

HIGH PRESSURE GAUGES

The RMC-Lindsay gauge, designed for pressures from 1,000 to 15,000 PSI, is a multiple coil, helical Bourdon tube type. The pointer is attached direct to the tube, without linkages or pivots. This gauge is made for extensive cycling, and will meet rigid vibration and over-pressure requirements—can withstand extreme conditions of shock, vibration or temperature. These gauges are made in various models to meet specified pressure requirements for a wide range of applications, including guided missile and jet aircraft service.

MODEL #6903-7 (Actual Size)

MODEL #6901 (Actual Size)

PRESSURE GAUGES

MODEL #2650—RMC pressure gauges are capable of withstanding very high overload pressures above a nominal scale reading. Various types are available in different models, sizes, etc. All are built for use on heavy-duty equipment, to maintain accurate readings regardless of mechanical vibration, or exposure to dust and weather.

PRESSURE/VACUUM SWITCHES

MODEL #2900—The RMC 2900 series is designed for service on vibrating equipment. Mechanism is sealed dust-proof and watertight. The diaphragm is Buna N impregnated and calibrated at the factory to close or open a contact at fixed pressure (or vacuum) values. Double or single terminal models. Pressures from 4 to 100 PSI. Vacuums from 4 to 26 in. Hg.

THERMOMETERS

MODEL #1848—RMC's general line of industrial thermometers cover just about every possible application. All are of stainless steel construction, with hermetically sealed dials. They are factory calibrated and pressure tested. External dial reset device permits on-the-job calibration for pin-point accuracy.

GACO

FLUID SEALING UNITS

Fluon & Silicone Components • Star Tolerance Rings • Gacots Textile Roller Coverings • Split Seals • Water Pump Seals

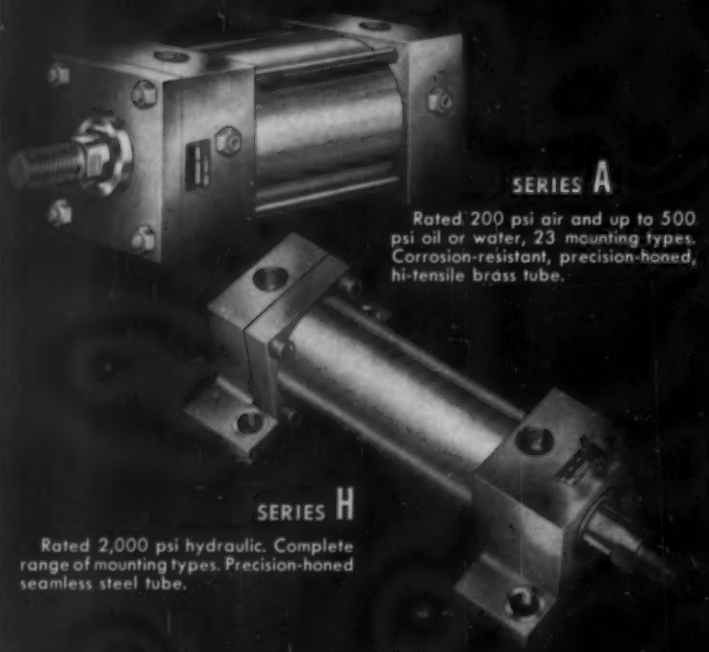
GEORGE ANGUS & Co LTD OIL SEAL DIVISION · COAST ROAD · WALLSEND-ON-TYNE

Telephone: Wallsend 64551 (10 lines). Telex. Angus Ntyne 53-254. Telegrams: Gaco, Wallsend.

for increased production . . .
minimum down-time . . .
lower costs . . . specify

SP

AIR and HYDRAULIC CYLINDERS



SERIES A

Rated 200 psi air and up to 500 psi oil or water, 23 mounting types. Corrosion-resistant, precision-honed, hi-tensile brass tube.

SERIES H

Rated 2,000 psi hydraulic. Complete range of mounting types. Precision-honed seamless steel tube.

- floating cushions—uniform cushioning—long life—fully adjustable
- easily removed cartridge-type rod seals with integral rod wiper
- choice of rod sizes for all applications—rods heat-treated and hard chrome plated for resistance to nicking and scoring
- steel heads and end plates for strength and positive alignment
- all ferrous parts rust-proofed

Before you buy any cylinder, consider the quality design and construction features of S-P air and hydraulic cylinders—features that will assure dependable performance . . . long service life . . . minimum down-time . . . lowest end cost.

What's your cylinder problem? We'd like to help you solve it—a phone call will bring our representative on the double. Prompt deliveries, too. The S-P Manufacturing Corporation, 30201 Aurora Road, Solon, Ohio.

SP for speed and performance

Representatives in principal cities. Phone or write for Catalogs No. 1108 (Series A) and No. 104A (Series H).

Find us fast in the "Yellow Pages"

NON-ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • VALVES ACCESSORIES

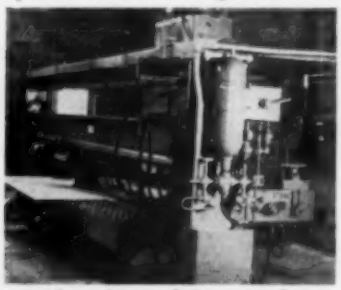
A BASSETT COMPANY • IN GREATER CLEVELAND • ESTABLISHED 1916

AA 7887

BRIEFS

All-Hydraulic Metal Cutter

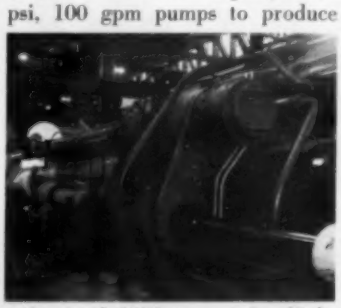
This transverse type metal cutting machine is capable of cutting 1 in. stainless steel at a rate of 3 ft per min. The cutting head may be operated laterally at any speed from 0 to 50 ft per min and



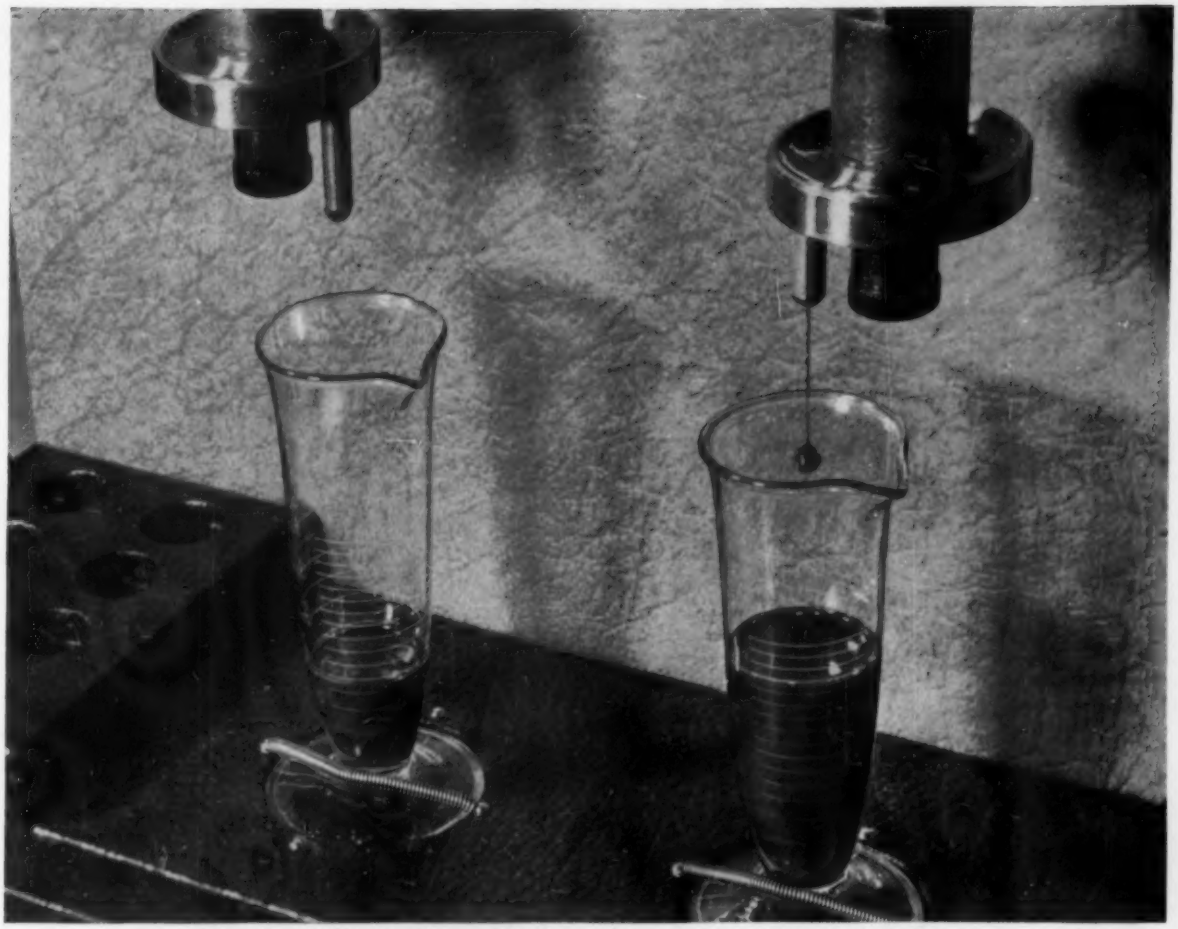
raised or lowered 0 to 10 ft per min. The machine made by Stone Machinery Co., Manlius, N. Y., is equipped with powerful hydraulic clamping feet for positive hold down of stock. Arbor speed is 2360 rpm and cuts of 12 ft in length are possible. ▼▼▼

Extrudes With 6300 Tons

An extrusion press built by Loewy-Hydropress, Division of Baldwin-Lima-Hamilton Corp., New York, N. Y. for the U. S. Navy and operated by Reynolds Metals Co. at their plant in Phoenix, Ariz. uses 6 triplex, 4500 psi, 100 gpm pumps to produce



a force of 6300 ton on its 60 in dia ram. The hydraulic circuit contains 5 accumulator bottles 15 ft high and 30 in dia. Each bottle has a minimum wall thickness of 4.85 in. The press can extrude billets up to 48 in long and 20 in dia. The press is used to extrude aircraft shapes and other defense materials. ▼▼▼



The oils collecting in these graduates are being forced, at 100 psi, through two sintered bronze bearings. Although each oil has the same viscosity, the Suntac on the left is leaking *only one quarter as much as* the straight oil on the right.

Desk-top demonstration proves that SUNTAC HYDRAULIC OILS can cut your oil losses . . . up to 75%

Suntac® oils are competitive in price, competitive in quality, *and unique in their ability to reduce oil leakage without costly shutdowns.*

Suntac oils are high-quality, exceptionally stable mineral oils especially compounded to reduce leakage. Experience proves that they give longer pump and seal life with higher overall operating efficiency.

See for yourself how a Suntac oil can cut your oil costs. A simple desk-top demonstration will show you how.

Ask your Sun man to show you how others have reduced oil consumption, or write to Dept. AH-6.

Industrial Products Department

SUN OIL COMPANY, Phila. 3, Pa.

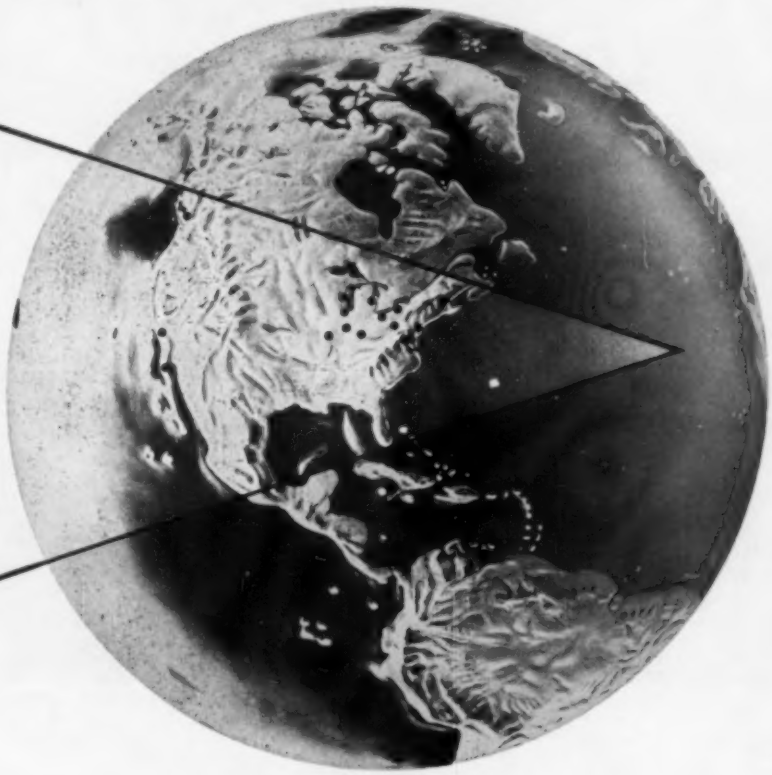
SUNOCO

© 1958 SUN OIL COMPANY

In Canada: Sun Oil Company Limited, Toronto and Montreal

ROCKRITE® TUBING-

in stock
at your
local
STEEL SERVICE CENTER



You can depend on your local steel service centers throughout the country to give you fast, dependable service on ROCKRITE *cylinder-finish* seamless tubing. Whatever your requirements...a single piece or a carload...you will always find a complete range of sizes immediately available from warehouse stock.

ROCKRITE Tubing was developed for use "as supplied" for cylinder applications. To the fine surfaces and close tolerances are added higher mechanical properties and exceptional machining qualities.

Write today for ROCKRITE Bulletin R7A and the name of your nearest steel service center.

Tube Reducing Corporation also is exclusive licensee for the "Niphos" process of nickel-phosphide coating to make mild steels corrosion resistant.

ROCKRITE® TUBING

TUBE REDUCING CORPORATION

520 MAIN AVENUE, WALLINGTON, NEW JERSEY

Mailing Address: P. O. Box 959-A Passaic, N. J.

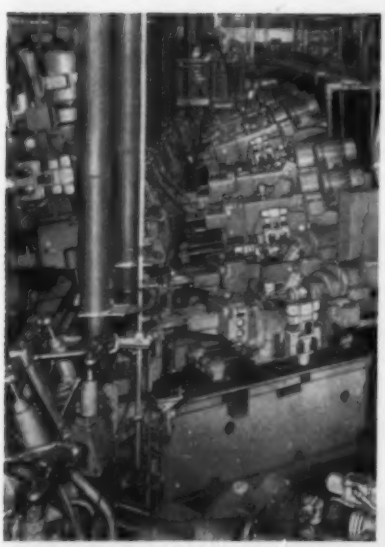
9-111

CIRCLE 115 ON READER SERVICE CARD

At The Ford Motor Company's Cleveland Engine Plant No. 1

AMERICAN BROACH & MACHINE DIVISION
BARNES DRILL COMPANY
BUHR MACHINE TOOL COMPANY
THE CROSS COMPANY
EX-CELL-O CORPORATION
EXPERT WELDING MACHINE CO.
THE FOOTE-BURT COMPANY
GREENLEE BROS. & CO.
THE HARTFORD SPECIAL MACHINERY CO.
THE HEALD MACHINE COMPANY
HOLCROFT & COMPANY
INDUSTRIAL METAL PRODUCTS CORPORATION
THE INGERSOLL MILLING MACHINE COMPANY
THE LAPOINTE MACHINE TOOL COMPANY
LANDIS TOOL COMPANY
THE R. K. LE BLOND MACHINE TOOL CO.
McDONNELL MACHINE TOOL, INC.
MICHIGAN TOOL COMPANY
MICROMATIC HONE CORPORATION
THE MORRIS MACHINE TOOL CO.
THE MOTCH & MERRYWEATHER MACHINERY CO.
NATIONAL AUTOMATIC TOOL CO.
SNYDER TOOL & ENGINEERING CO.
SUNDSTRAND MACHINE TOOL CO.
WICKES MACHINE TOOL DIVISION
WILSON AUTOMATION COMPANY

VICKERS HYDRAULICS
HELPS CUT MAINTENANCE COSTS
of Machinery Supplied by These Companies to This Modern Automated Plant



Typical transfer line installation shows ample use of Vickers hydraulics for actuation and control of automated operations.

High production is convincing proof of equipment reliability—one of many reasons why Vickers Hydraulics is engineered into equipment for modern automated production plants.

The above manufacturers find that Vickers Hydraulics simplifies installation and minimizes piping—benefits also enjoyed by the user. Vickers highly efficient pumps produce significant power savings . . . Vickers controls help minimize scrap and rework by providing precise positioning for machining and other in-process operations. Component dependability helps provide extended periods of uninterrupted production. Demountable unit construction simplifies on-the-job repairs and helps reduce downtime.

The Vickers complete line of components is ideally suited to hydraulic equipment standardization and interchangeability, reducing replacement inventory. Our application engineers will supply detailed information without obligation. General Catalog 5001B is available upon request.

7996

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division

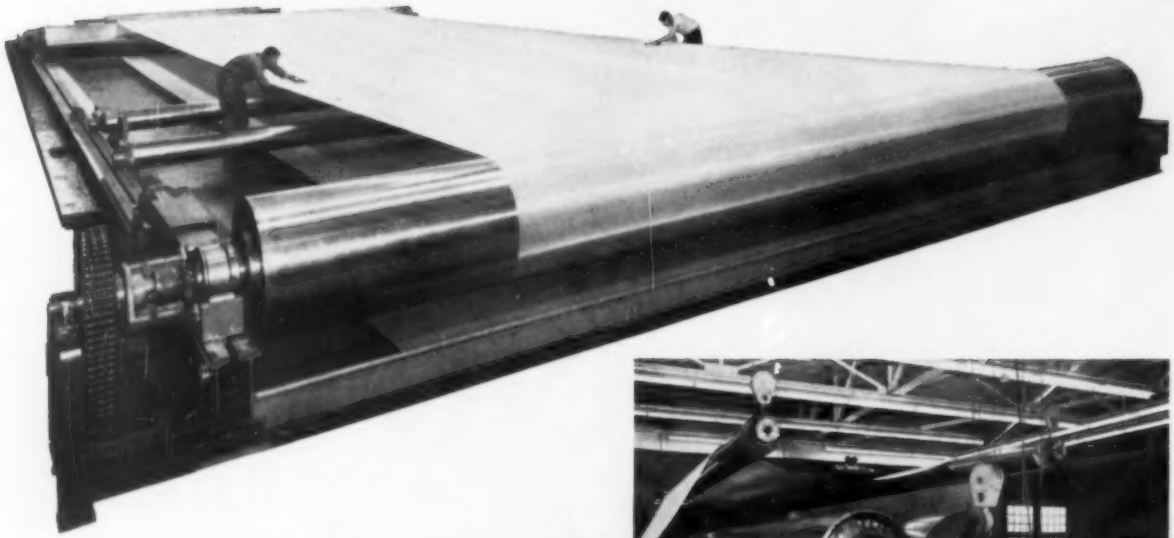
ADMINISTRATIVE and ENGINEERING CENTER
Department 1474 • Detroit 32, Michigan

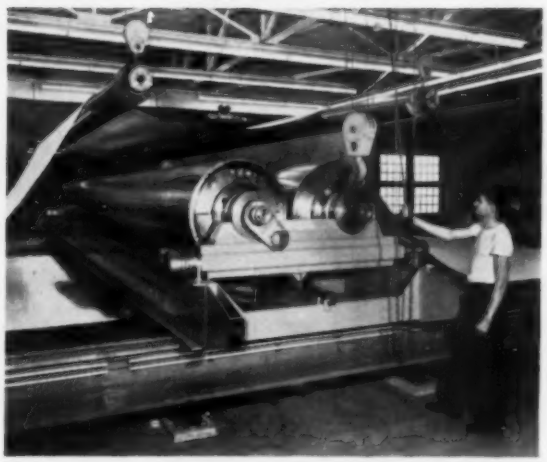
Application Engineering Offices: ATLANTA • CHICAGO CINCINNATI • CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.) PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER • ROCKFORD SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS TULSA • WORCESTER • Factories also in: AUSTRALIA, ENGLAND, JAPAN AND GERMANY • In Canada: Vickers-Sperry of Canada, Ltd., Toronto, Montreal and Vancouver

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

CIRCLE 122 ON READER SERVICE CARD

In specialized applications...
ACIPCO *CENTRIFUGALLY SPUN* STEEL TUBES





Appleton Wire Works, Inc., manufactures high quality fourdrinier wires for paper making machines. These fine-mesh wires are woven in widths up to 340 inches and lengths over 180 feet.

At its Montgomery, Alabama, plant, Appleton Wire Works, Inc. uses ACIPCO steel tubes— centrifugally spun and polished at Acipco—as stretch rolls on the huge finishing table. These 35.625″ OD, 410″ long rolls must be both dimensionally stable and balanced and must have a polished surface which will not affect the delicate woven wire surface mechanically or chemically.

Here is another example of Acipco versatility. If your application requires heavy wall steel or alloy iron tubes with special physical, chemical or metallurgical properties "built-in," Acipco can serve you. Investigate Acipco's complete "one source—from start to finish" facilities. A call or letter will bring full information on Acipco centrifugally spun tube applications in your field.

VERSATILE ACIPCO CENTRIFUGALLY SPUN STEEL TUBES

Size Range: Lengths up to 410″ to meet modern machinery requirements have been produced. OD's from 2.25″ to 50″; wall thicknesses from .25″ to 4″.

Analyses: All alloy grades in steel and cast iron, including heat and corrosion resistant stainless steel, plain carbon steel and special non-standard analyses.

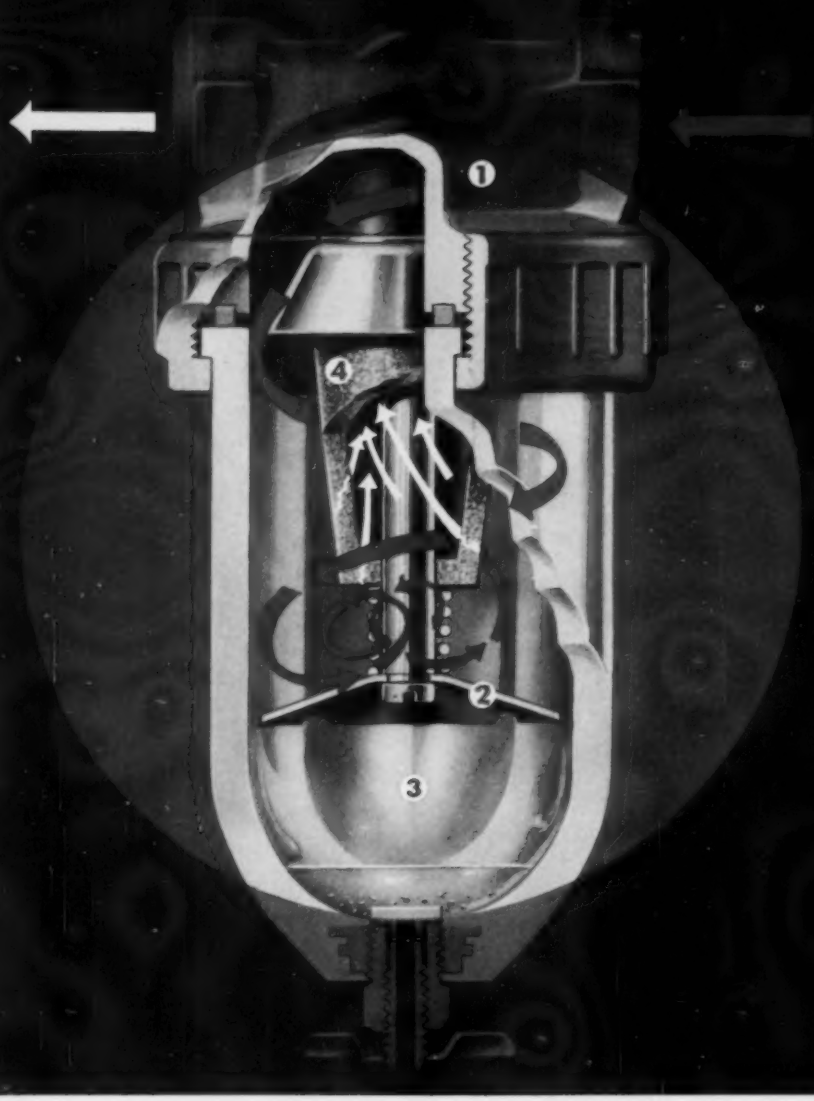
Furnished: As cast, rough machined, or finished machined, including honing. Complete welding and machine shop facilities for fabrication.

SPECIAL PRODUCTS DIVISION
AMERICAN CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

ACIPCO

CIRCLE 7 ON READER SERVICE CARD

CIRCLE 127 →



Curved inlet (1) directs incoming air in downward helical pattern. Larger impurities and condensate are "thrown out" by centrifugal action, collecting on bowl sides and spiraling downward past baffle (2) into quiet chamber for draining-off. Baffle traps sediment in quiet chamber (3) and allows only dry air centrifugally cleaned of larger impurities to reach filter element (4) where finer particles are filtered out.

New "TORNADO ACTION" of high-efficiency filter really cleans air flowing to pneumatic equipment

You add service life to equipment and reduce maintenance costs to the minimum with Watts High-Efficiency air line filters. The exclusive Tornado Action designed into Watts filters delivers really *clean* dry air.

WATTS REGULATORS — sensitive "ASPIRATOR ACTION" maintains more uniform pressure

Aspirator acts directly on diaphragm giving instant compensation for fluctuating loads . . . provides precise control and stabilizes pressures reaching individual pieces of equipment.

Write for free technical catalog. Charts, diagrams, and performance data enable you to specify the correct Watts pneumatic equipment.

You can expect *high efficiency* from the advanced-design Watts line of filters, regulators and lubricators. Specialists in protection and control devices since 1875, Watts is creating new *standards* of efficiency in pneumatic operation.

WATTS LUBRICATORS — exclusive "BY-PASS PICK-UP" assures efficient lubrication

High velocity venturi section provides efficient atomization at air flow rates as low as 1 CFM. Automatic bypass valve assures complete atomization with negligible pressure drop at high air flow rates. Result: wide range performance *in a single unit.*

WATTS

FILTERS
REGULATORS
LUBRICATORS

YOUR **SAFE** SPECIFICATION

Watts Regulator Company — Industrial Division — 6 Embankment Road — Lawrence, Massachusetts

Tubexperience in action

Brightness alone is not the true measure of hydraulic tubing quality!

*Bright ID and OD surfaces are important in hydraulic tubing. But mere brightness is not enough! Superior SAE Hydraulic Tubing delivers unsurpassed brightness; plus these other vitally important advantages—

High ductility! Furnished in dead-soft annealed temper, Superior hydraulic tubing flares easily, bends without pinching, is readily fabricated for any hydraulic application.

Non-aging steel! All Superior carbon hydraulic tubing is made of selected non-aging steel. It keeps its ductility. Will not become brittle with age. Carbon content is limited to .12% maximum.

Fully tested! And not mere random sample testing! Every length of Superior SAE Hydraulic Tubing is 100% hydrostatically tested at maximum working pressure—giving you realistic performance insurance.

Rust preventive coating! All Superior SAE Hydraulic Tubing is shipped to you specially coated with a rust preventive on both inside and outside surfaces. Not just a coating of oil!

Special processing gives Superior hydraulic tubing an unusually bright, lustrous, smooth, clean ID and OD finish. No premium costs to pay for bright, bright surfaces with Superior tubing!

Available coast to coast through leading warehouse distributors, each a steel service center. Contact your nearest Superior distributor—or, for more information, send for a free copy of Bulletin 39. Superior Tube Company, 2030 Germantown Ave., Norristown, Pa.

Superior Tube

The big name in small tubing

NORRISTOWN, PA.

All analyses .010 in. to ⅜ in. OD—certain analyses in light walls up to 2½ in. OD

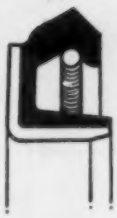
West Coast: Pacific Tube Company, 5710 Smithway St., Los Angeles 22, Calif. • RAymond 3-1331

TYPE 11 P

The standard rotary shaft seal. Gives perfect sealing at high speeds and for long periods, with minimum frictional loss.

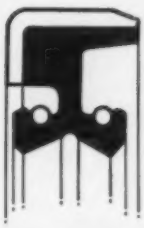
TYPE 11 P/B

As type 11 P but with the casing covered with rubber. Interchangeable with metal case seals.



TYPE 23 P

An external seal used when fitting conditions prevent the use of 11 P or 11 P/B seals.



TYPE 12 P

A rotary shaft seal used to separate two different fluids.

TYPE 13 P

Similar to type 12 P but without a spring on the second lip which serves as a dust excluder.

TYPE 31 P

A springless seal used as a wiper or dust excluder for rotating or reciprocating shafts.

NU-LIP RINGS

A special section ring which cannot twist. Superior to the O-ring for low and medium pressure non-static applications.

O-RINGS

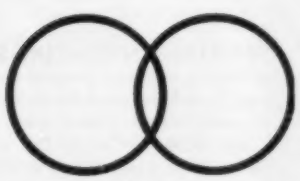
A compact automatic seal for reciprocating and static applications over a wide range of temperatures and pressures. All British Standard sizes in stock.

TYPE 7 P

A hydraulic and pneumatic seal used chiefly on reciprocating pistons or as a valve stem packing. Normally fitted in a groove.

PIONEER OILSEALS O-RINGS AND HYDRAULIC PACKINGS

Every fluid sealing application comes within the Pioneer range. Write NOW for the PIONEER OILSEAL LITERATURE.



PIONEER OILSEALING & MOULDING CO. LTD.

A DIVISION OF J. H. FENNER & CO. LTD

Factory and Head Office: Cottontree Works, Colne, Lancs, England

USEFUL LITERATURE

For your free copy of publications reviewed, fill in the reader service card

SOLENOID VALVES . . . for nuclear reactors are described and illustrated in a 4-page brochure prepared by *Automatic Switch Co., Florham Park, N. J.* It contains pictures of valves used in the primary and secondary systems in pressurized water reactors. Application data is included which will aid in the design of reactor control systems.

CIRCLE 400 ON READER SERVICE CARD

AIR COMPRESSORS . . . requiring no lubrication are described in a bulletin No. 3251 issued by *Ingersoll-Rand, New York, N.Y.* It gives a complete description of the cylinder and valving required for the non-lubricated compressors, available from ½ to 2000 hp.

CIRCLE 401 ON READER SERVICE CARD

HYDRAULIC PUMP/MOTOR . . . is featured in a 2-page technical bulletin from *Berry Hydraulics, Division of Tyrone Corp., Pittsburgh, Pa.* Featured are operating characteristics, performance curves, and detail drawings showing dimensions for flange-mounted and base-mounted types.

CIRCLE 402 ON READER SERVICE CARD

VIBRATION MOUNTINGS . . . for machinery are covered in a 4-page bulletin from *The Korfund Co., Inc., Long Island City, N.Y.* It tells how to select the proper size and includes application and installation data.

CIRCLE 403 ON READER SERVICE CARD

MEDIUM PRESSURE HOSE AND FITTINGS . . . Catalog shows reusable over-the-cover fittings for cotton-covered single wire braid hose, stainless steel braided cotton covered hose, double fibre braided hose, and dacron-wire-dacron hose for high temperatures. Assemblies are cataloged and make-up instructions included. Catalog 4420 is available from *Parker Fittings & Hose Div., Parker Hannifin Corp., Cleveland, Ohio.*

CIRCLE 404 ON READER SERVICE CARD

HYDRAULIC CYLINDERS . . . for 2000 psi service are illustrated in bulletin 71000 published by the *Oilgear Co., Milwaukee, Wis.* It

gives dimensions on foot lug, center lug, front flange, rear flange, and clevis mounted cylinders in 2 to 8 in bore sizes. Featured are, short alloy steel tie bolts, automotive type piston rings, bar steel end heads, preloaded ram packing, and long bronze ram guides.

CIRCLE 405 ON READER SERVICE CARD

TEMPERATURE CONTROLS . . . are presented in catalog 400 from *United Electric Controls Co., Watertown, Mass.* It describes many local mounted and remote bulb temperature controls for general purpose and explosion-proof applications. The specifications are in charts arranged for quick identification of the proper model.

CIRCLE 406 ON READER SERVICE CARD

PACKLESS VALVES . . . for high temperature service are covered in Engineering bulletin 10-47 released by *Hoke, Inc., Englewood, N.J.* It shows outline drawings of valves designed for control of radio-active material which may be in the form of liquid metals or corrosive salts, and reach temperatures of 1500 deg F and pressures to 2000 psi.

CIRCLE 407 ON READER SERVICE CARD

3-WAY AIR PILOT VALVES . . . are featured in a 4-page folder published by *Logansport Machine Co., Inc., Logansport, Indiana.* The valves are intended for use in air circuits to eliminate limit switches and electric push buttons. The folder lists mounting dimensions, flow curves, and typical circuits where the valve is used.

CIRCLE 408 ON READER SERVICE CARD

MOLDED CUP PACKING . . . for hydraulic and pneumatic equipment is illustrated in a bulletin published by *The Garlock Packing Co., Palmyra, N.Y.* Booklet AD-145, details the construction, recommended service, and sizes of synthetic rubber, leather, reinforced synthetic rubber, metal bonded, and metal reinforced cups.

CIRCLE 409 ON READER SERVICE CARD

TUBE FITTINGS . . . for straight-thread hydraulic connections are covered in a 20-page Catalog 058 published by *Flodar Corp., Cleveland, Ohio.* It provides engineering details and installation instructions on the line which includes 45 deg and 90 deg elbows, tees, and plugs. Engineering drawings of each type are included along with a table of dimensions for each size.

CIRCLE 410 ON READER SERVICE CARD

For more reviews of FREE LITERATURE turn to page 134

*Snap-Tite

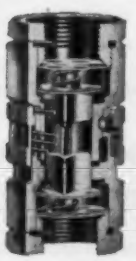
QUICK-CONNECT
QUICK-DISCONNECT COUPLINGS

in larger sizes

immediate delivery
FROM FACTORY STOCKS

SNAP-TITE'S "H" COUPLING, SIZE FOR SIZE, IS THE SMALLEST COUPLING WITH HIGHEST STRENGTH AND HIGHER EFFICIENCY

Snap-Tite's "H" Couplings are now factory-stocked for quick shipment to you, not only in the smaller sizes (below 1" ID) but in all sizes up to and including 3"—in steel, brass, aluminum, and 303 and 316 **Stainless Steel.** And "H" Couplings can be made to your order, up to 10" ID.



Available with valves to give two-way or one-way automatic line shut-off, or without valves for straight-thru flow, "H" Couplings are built to handle high pressures in hydraulic and air systems.

Recessed valve washers . . . fluted valve stems . . . valve stops with minimum flow restrictions . . . large inside diameter—allow maximum flow capacity with lowest pressure drop.

See the Snap-Tite representative in your city or write for Bulletin 240.

*Snap-Tite, INC.

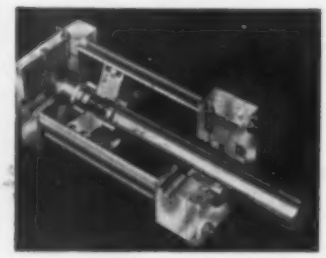
UNION CITY 1, PENNSYLVANIA

SNAP-TITE COUPLINGS CAN HANDLE ALMOST ANYTHING THAT FLOWS

NEW PRODUCTS

Components, tools and equipment for fluid power systems. For more information fill in and mail post card bound in this issue.

NEW CYLINDER DESIGN . . . saves space



Designation: Squaremaster

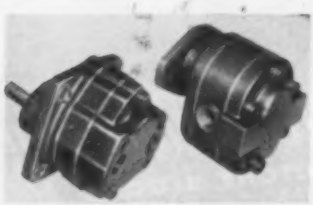
Design: Each cylinder is designed with a safety factor of five. To reduce friction and wear the tubing is honed and polished. Bronze floating-cushion bushings give smooth operation and built-in check valves provide instantaneous reversal. Replaceable cartridge-type piston rod bearings are easily serviced without dismantling the cylinder.

Specifications: They are recommended for air pressures to 150 psi and oil pressures to 500 psi. Cylinders are made in 23 models, each in 10 bore diameters. Standard mountings include, tie rod extension, angle foot, lug foot, trunnion, blind end flange, rod end flange, and clevis.

Rivett Inc.
Boston, Mass.

CIRCLE 300 ON READER SERVICE CARD

GEAR PUMPS & MOTORS . . . for 1500 psi circuits



Designation: Powermax

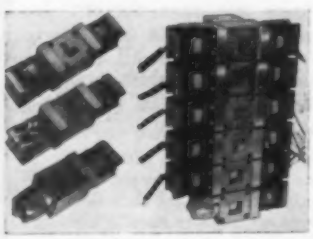
Specifications: Seven models available with pump capacities from 1.2 to 14.2 gpm at 1500 psi. Pumps and motors are built for speeds to 3600 rpm. They are spur gear construction and compact in design.

Design: Features are large heavy duty anti-friction bearings, hard long wearing double wear plates of bronze alloy, double lip type shaft seals, heat treated alloy steel shaft, and heavy duty outboard ball bearings for over-hung shaft loads.

Tuthill Pump Co.
Chicago, Ill.

CIRCLE 301 ON READER SERVICE CARD

SMALL AIR AND OIL VALVES . . . are manifold mounted



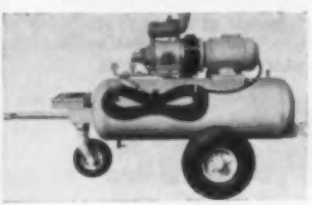
Features: Valves are small and designed for high cycling. Up to six valves can be mounted on a subplate 12½ in long. They are intended to provide a compact multiple valve installation for controls on machine tools and other production equipment.

Specifications: The double solenoid valve is 2 in wide, 2¼ in high and 8½ in long. The single solenoid valve is 2 in wide, 2¼ in high and 7¼ in long. They have ¼ in ports, and are made in 2, 3, and 4-way types with solenoid, pilot, or manual control. All spool types are available, and special spools can be furnished to meet requirements.

Beckett-Harcum Co.
Wilmington, Ohio

CIRCLE 302 ON READER SERVICE CARD

PORTABLE COMPRESSOR. . . . powers pneumatic machines



Designation: MB-2

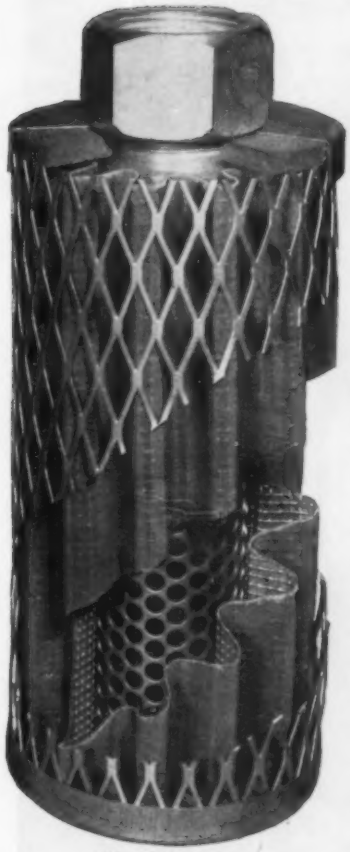
Design: Compressor unit is mounted on two wheels with a retractable 3rd wheel and can be moved by one man. It is a sliding valve rotary unit, oil cooled, mounted on top of the air receiver. Compressor has a capacity of 16 cfm at 200 psi and weighs 800 lbs. It was designed for the aircraft industry but is suitable for operating pneumatically powered tooling and machines.

Davey Compressor Co.
Kent, Ohio

CIRCLE 303 ON READER SERVICE CARD

For more NEW PRODUCT reviews turn to page 120

Here's What Users Have to Say About
MARVEL Synclinal FILTERS



SUMP TYPE (Cutaway)

U. S. STEEL CO., Irvin Works Three-Stand Cold Reduction Mill—

"Marvel Synclinal Filters are a part of the mill's main hydraulic system which operates Coil Cradle as well as other hydraulic machines".

JONES & LAUGHLIN STEEL CORP., Aliquippa Works—

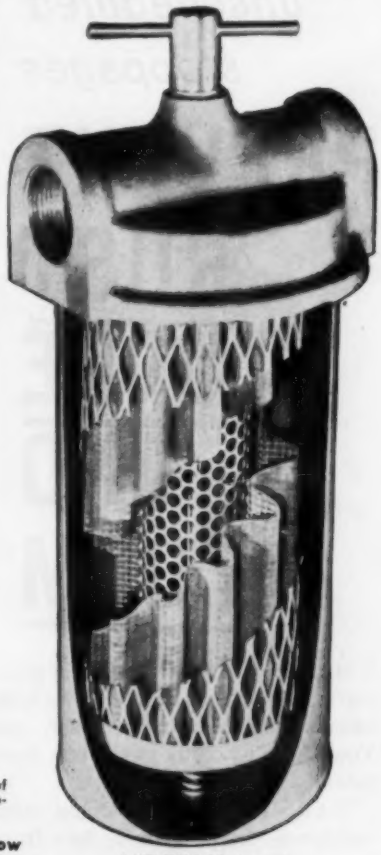
"Marvel Synclinal Filters proved their effectiveness when one of the motors on the hydrostatic pipe testers broke down. A brass fitting was chewed up and jagged pieces of brass were carried into the oil stream. Any small piece of brass could also have caused a great deal of damage to the expensive equipment. However, when the unit was inspected, it was found that all metal particles had been filtered out by the Marvel Synclinal Filters and no damage had been done to the equipment nor was there any loss in operating time. Two filters are installed on each circuit so that one can serve as a by-pass while the other is being cleaned. Although it takes only about fifteen minutes to clean the monel filter insert, even this short interruption in production could be costly in an operation of this size".

P. R. MALLORY PLASTICS, INC.

Supt. of Maintenance Leo Paszkiet reports—

"We have one injection molding press here that was giving me a lot of trouble. I had to stop it every two or three weeks to service the filters. It was a troublesome, time consuming job but it had to be done. Well, I had enough of that so I pulled out the original filters and replaced them with Marvel Synclinal Filters. That was over 10 months ago. During all this time the machine was operating faster and smoother than it ever had before. On the basis of these results, we are installing Marvels on every hydraulic machine in our plant, except of course, those on which Marvel Synclinal Filters were installed as standard equipment by the manufacturer.

Many others reporting similar results are now specifying MARVEL SYNCLINAL FILTERS on all new hydraulic equipment—and Standardizing with MARVEL SYNCLINAL FILTERS on all existing equipment.



LINE TYPE (Cutaway)

OVER 800
Original Equipment Manufacturers

of stationary or mobile equipment utilizing hydraulic or other low pressure liquid circulating systems are installing Marvel Synclinal Filters as Standard Equipment.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

EASY TO CLEAN

Both sump and line types are easily disassembled, thoroughly cleaned and reassembled, on the spot, in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

IMMEDIATE DELIVERY

Our catalogs contain complete engineering data and dimensional charts of all models and sizes. You can order a filter to meet your specific requirements and get IMMEDIATE DELIVERY.

For further information, write, wire, phone or use coupon below

MEET J. I. C. STANDARDS

MARVEL ENGINEERING COMPANY

7227 N. HAMLIN AVE., CHICAGO 45, ILLINOIS

Phone: JUNIPER 8-6023

Without obligation, please send me complete data on Marvel Filters, as indicated: (AH-6)

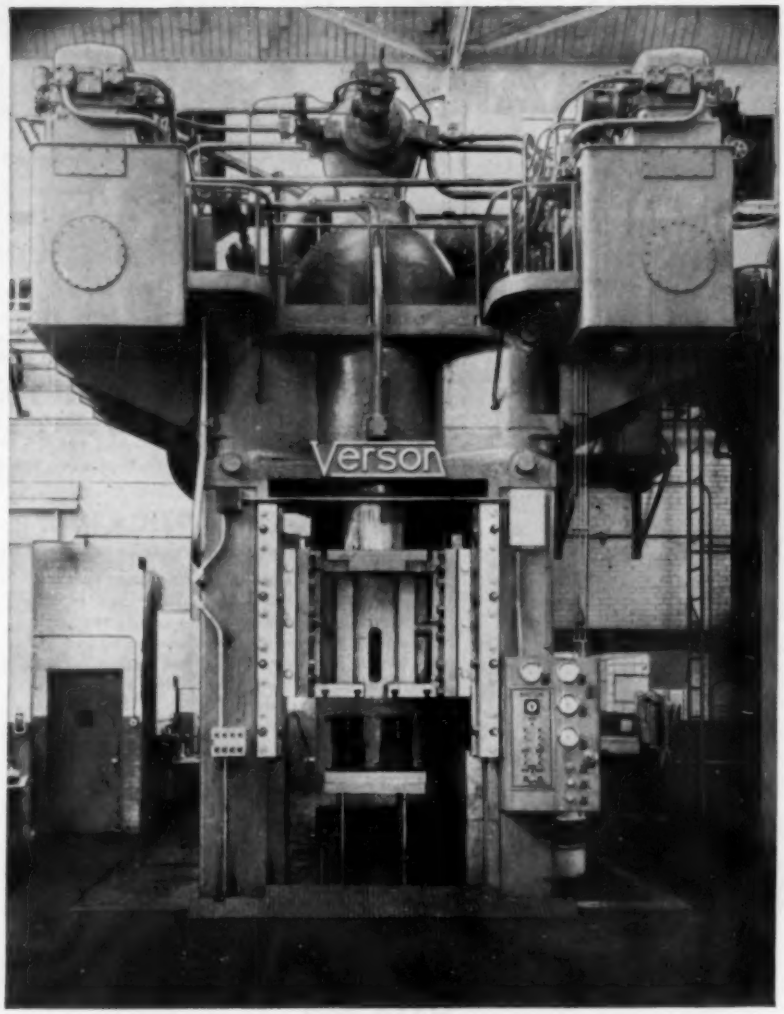
- ☐ Catalog #100—For Hydraulic Oils, Coolants, Lubricants
- ☐ Catalog #200—For Fire-resistant Hydraulic Fluids (Aqueous Base)
- ☐ Catalog #400—For Fire-resistant Hydraulic Fluids (Synthetic)
- ☐ Catalog #301—For Water

Name _____ Title _____

Company _____

Address _____

City _____ State _____



Avoid unscheduled stoppages

PREVENT RUST SLUDGE AND FOAM *with Texaco Regal Oil R&O*

With Texaco Regal Oil R&O in your hydraulic system you'll have no rust, no sludge, no foam. Equipment will function smoothly and dependably, parts will last longer. You'll have no costly production downtime due to fluid failure.

Texaco Regal Oil R&O has outstanding oxidation resistance—keeps systems free from sludge. Special Texaco additives prevent rust and foam. And these properties last throughout the oil's exceptionally long service life.

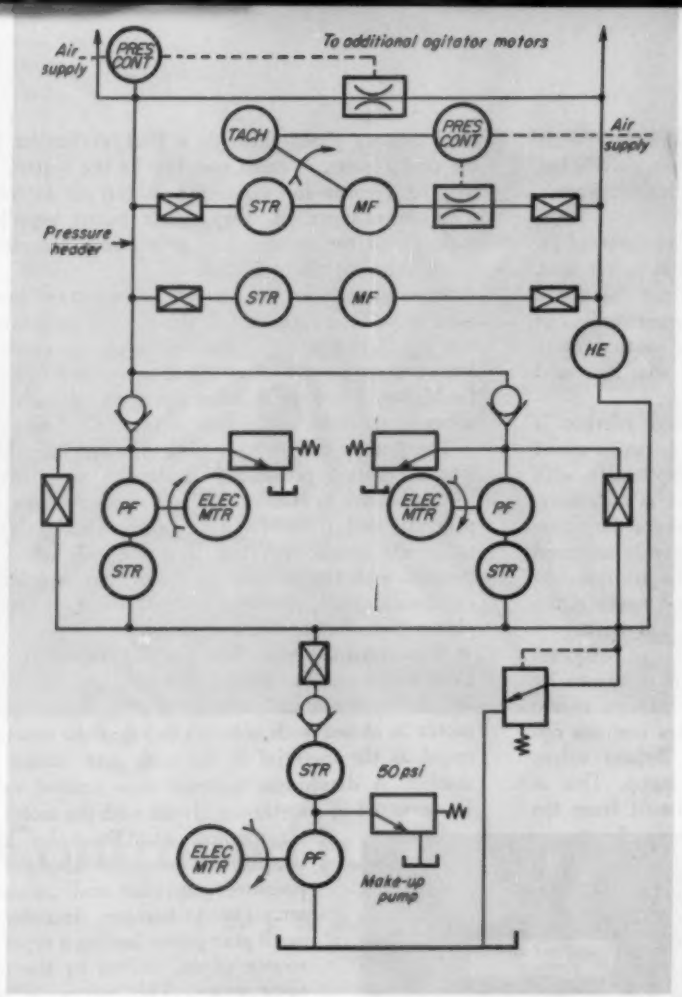
Texaco Regal Oil R&O is available in a complete line to meet every operating condition, and for every size and type of hydraulic system. Ask a Texaco Lubrication Engineer to help you protect your hydraulic equipment from rust, sludge and foam. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

CIRCLE 113 ON READER SERVICE CARD



TYPICAL AGITATOR DRIVE has two pumps delivering in parallel with inlet pressurized by a small gear pump.

Selecting a drive for low speed agitators

• By Willard Spencer, *Hummel Technical Products, Inc., New York, N. Y.*

IN chemical, pharmaceutical, rubber, and plastic plants, one of the steps in making the product is frequently to cook it up under heat and pressure in a large tank and agitate it at the same time. In a large plant, there may be a long row of tanks, each with its own agitator. Generally these tanks are large and require from 5 to 50 hp or more. Torque must also be high, since speeds are usually under 500 rpm.

• **Drive Requirements**—Speed control is usually a requirement in an agitator drive. When tanks are installed for production of a new product, the engineers may have a fairly good idea of the speed and power for the agitator from previous operation in a pilot plant, but they cannot be absolutely sure what will be required in production. After the equipment is installed, they learn by experience what the ideal speed and torque are. Therefore a fluid motor drive in which speed and power are easily varied is excellent.

Frequently in the industries where these agitators are required, flammable materials are being

processed. Therefore an explosion proof drive is needed. This is easy to get in hydraulic drives, but can be difficult and costly with equivalent electrical drives.

In the hydraulic design, fluid motors mounted on each tank are all driven from a central power unit. This is located in another room to get the explosion proof characteristics. This power unit can have provisions for extra capacity, so that more power can be supplied for future additions and modifications.

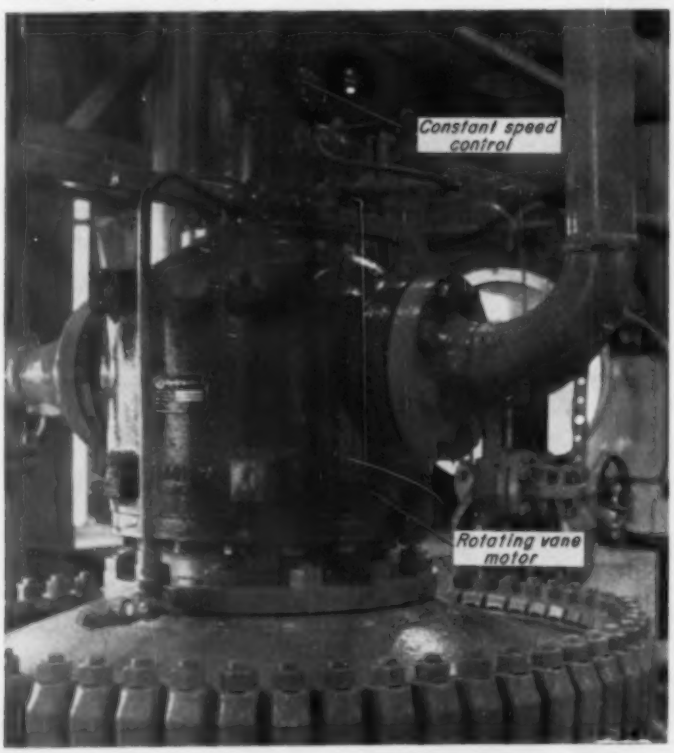
Because final speeds are low, a large gearbox is required for an electric motor which has a speed of 1200 or 1750 rpm. A further complication with the large electric motor and gearbox is mounting. To minimize the sealing problems where the agitator shaft goes into the tank, the drive is mounted on top, so that the seal is above the air space in the tank. With the electric motor and gearing, the tank must support a lot of weight and bulk.

• **System Operation**—The circuit diagram shows a typical installation. Two pumps driven by 75-hp and 60-hp motors deliver in parallel to the system through check valves, so either one can operate without affecting the other. Bypass valves permit manually unloading either pump. This is essentially a closed system with exhaust from the fluid motors piped through a heat exchanger to the pump inlets. A small reservoir in the system is to give a space for expansion of the oil as temperature changes. A very small pump supplies make-up to the system and pressurizes the main pump inlets at about 50 psi.

Since all motors are in parallel, constant pressure must be maintained at their inlets to prevent stalling if one agitator load rises above another. Pressure required to rotate that motor would then be higher. Since fluid takes the path of least resistance, no fluid would flow to the stalled motor.

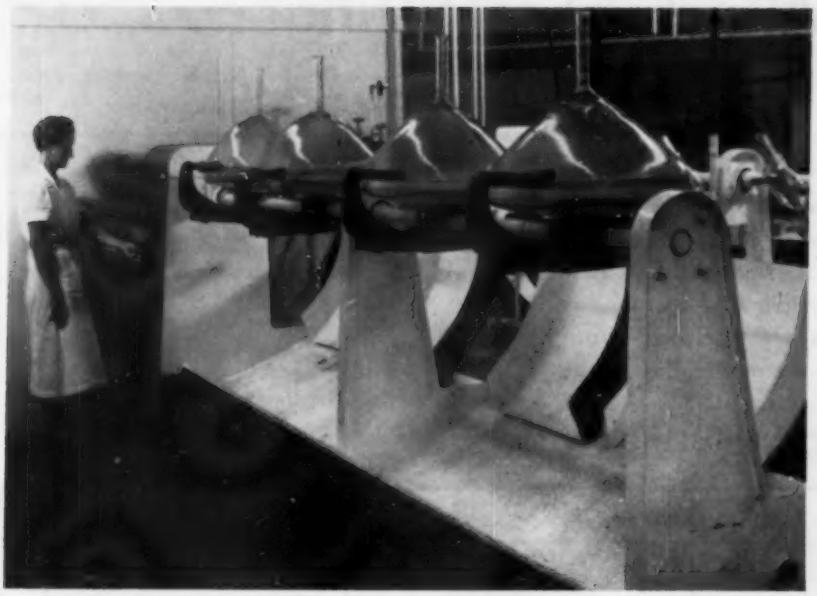
The pumps deliver to a high pressure manifold where constant pressure is accurately maintained by a pressure controller. This controller senses oil pressure and transmits a proportional air signal to a diaphragm-operated flow control valve in parallel with the motors. As motors are connected or disconnected, the flow control valve opens or closes to maintain constant pressure.

• **Constant Speed**—The shut-off valves in the fluid motor circuits permit operating any agitators and also give manually set speed control. The upper motor is shown with controls to maintain constant speed as the material in the tank gets thicker or thinner. A diaphragm-operated flow control valve is connected in a meter-out circuit with the motor to throttle flow out of the motor. This is pressure-compensated by the pressure controller and tachometer. The tachometer includes a small gear pump, having a separate source of oil, driven by the agitator motor. This pump delivers through a fixed orifice, so that its outlet pressure is proportional to its speed. A pressure gage connected in the outlet is calibrated in agitator rpm. The pressure is also sensed by a pressure controller which transmits an air signal to the diaphragm-operated flow control valve. As the material being agitated gets thicker, and motor back-pressure decreases, the tachometer tends to slow down, so that the pressure at its outlet decreases. The controller then decreases air pressure to the flow control valve which opens to allow the same flow at the lower back-pressure.



Motor shown mounted vertically on tank has same construction as pumps. The unit has no reciprocating parts or sliding metal-to-metal contacts. The hydraulically balanced, liquid seal principle and low friction design give volumetric efficiency of 90 to 95% and overall efficiency of 85 to 90% depending on the fluid viscosity and working pressure. The unit operates with non-lubricating fluids.

• **Limitations**—For tanks in the range of 1000 to 4000 gallons, an agitator speed of 300 rpm is about tops, so that a fluid motor can drive the agitator directly. Generally if the power is 5 to 20 hp at very low rpm, the agitator can be driven directly. 100 hp at low rpm requires a gear reducer. ▼▼▼



THESE four 27-in. TV tubes will be decanted at a constant rate to get a screen of uniform density. It will take 15 minutes to pour 70 gallons from the tubes.

Controlled turning puts screen on TV

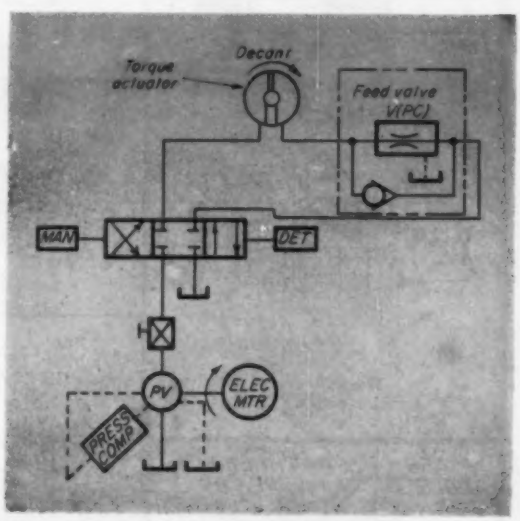
• By E. K. Kaucher, *Design Engineer, Philco Corp., Lansdale, Pa.*

BIG video tubes create bigger manufacturing problems. For example, just pouring off the fluid (decanting we call it) with which the tube is filled for the formation of the picture screen took special machinery. We controlled decanting by designing a torque actuator driven fixture. A pressure compensated meter-out circuit gives smooth motion regardless of the changing load weight.

FLOW CONTROL METERS 12 CIPM

The load at the mean center of gravity is approximately 4,600 in-lbs. The pump supplies 250 psi and a build up of 260 psi on the actuator vane gives a total pressure of 510 psi on the feed valve. With the valve set at about 12 cu in per minute, four tubes, which hold about 70 gallons of solution are decanted in 15 minutes.

Controlled decanting on the smaller cathode-ray tubes, was not as critical. Simple check and needle valves allowed free flow in one direction for the return, and an orificed restriction for flow through the decanting cycle. Rate of decanting varied with the size of the load. Water was used as the hydraulic medium and left a lot to be desired. ▼▼▼



SIMPLE meter-out circuit controls rate of actuator movement.

Which hose fittings?

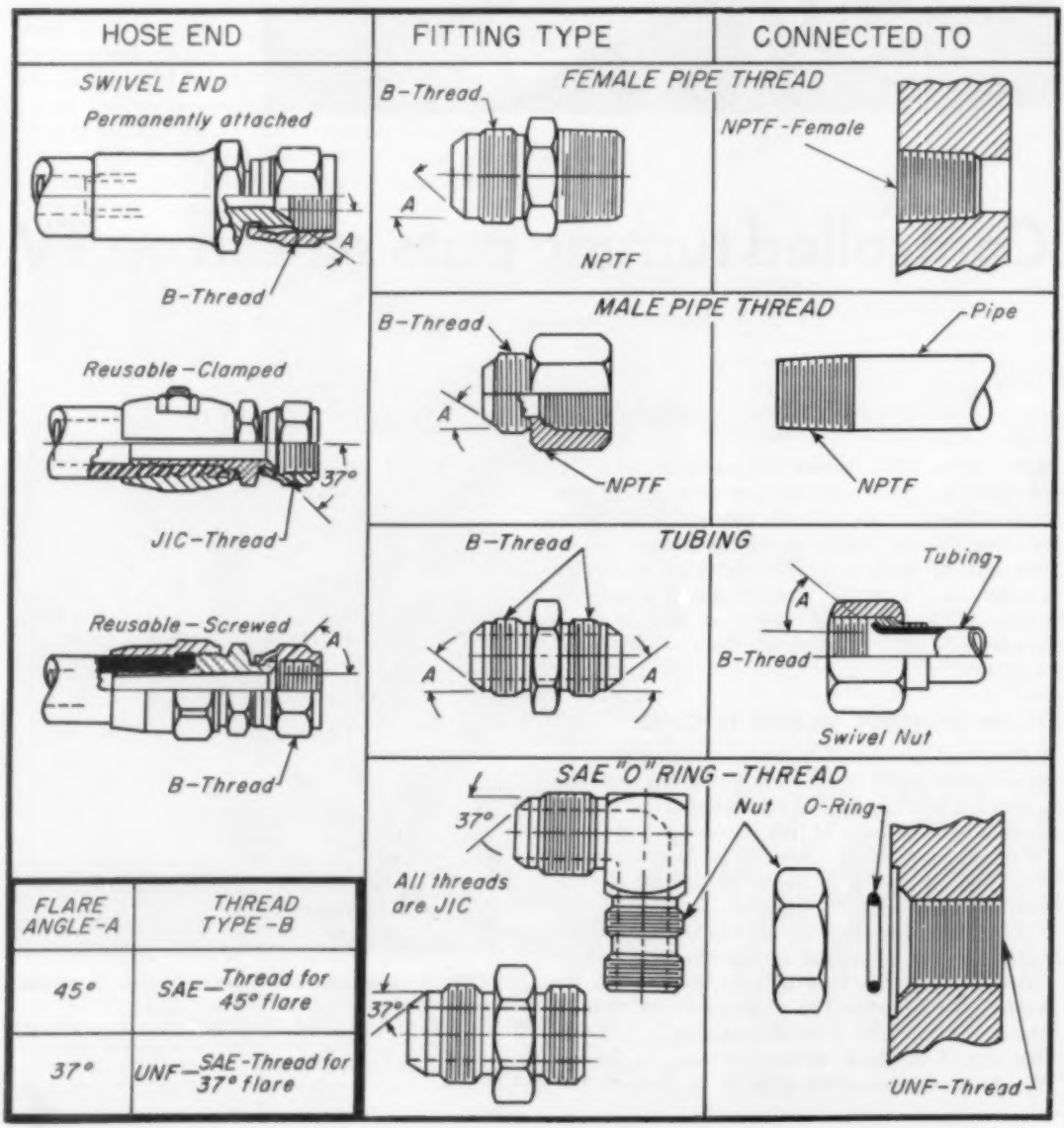
• By Jerry Taborek, *Towmotor Corp., Cleveland, O.**

Although most designers recognize the value of straight-thread and flange connections for leakage control, many are waiting for further standardization before using them. Opinions on whether to use swaged or reusable hose-ends are divided about equally. These charts summarize the various ways of connecting hose.

**Now with Philipps Petroleum Corp., Bartlesville, Okla.*

HOSE fittings are made in different types and flare angles. Each flare angle has its own thread type, so that manufacturers and users have to stock many parts. This variety is also confusing to designers. The standardization of the Joint Industry Conference is a big step in simplification. However, until the older types are completely replaced, this standardization has complicated things even more.

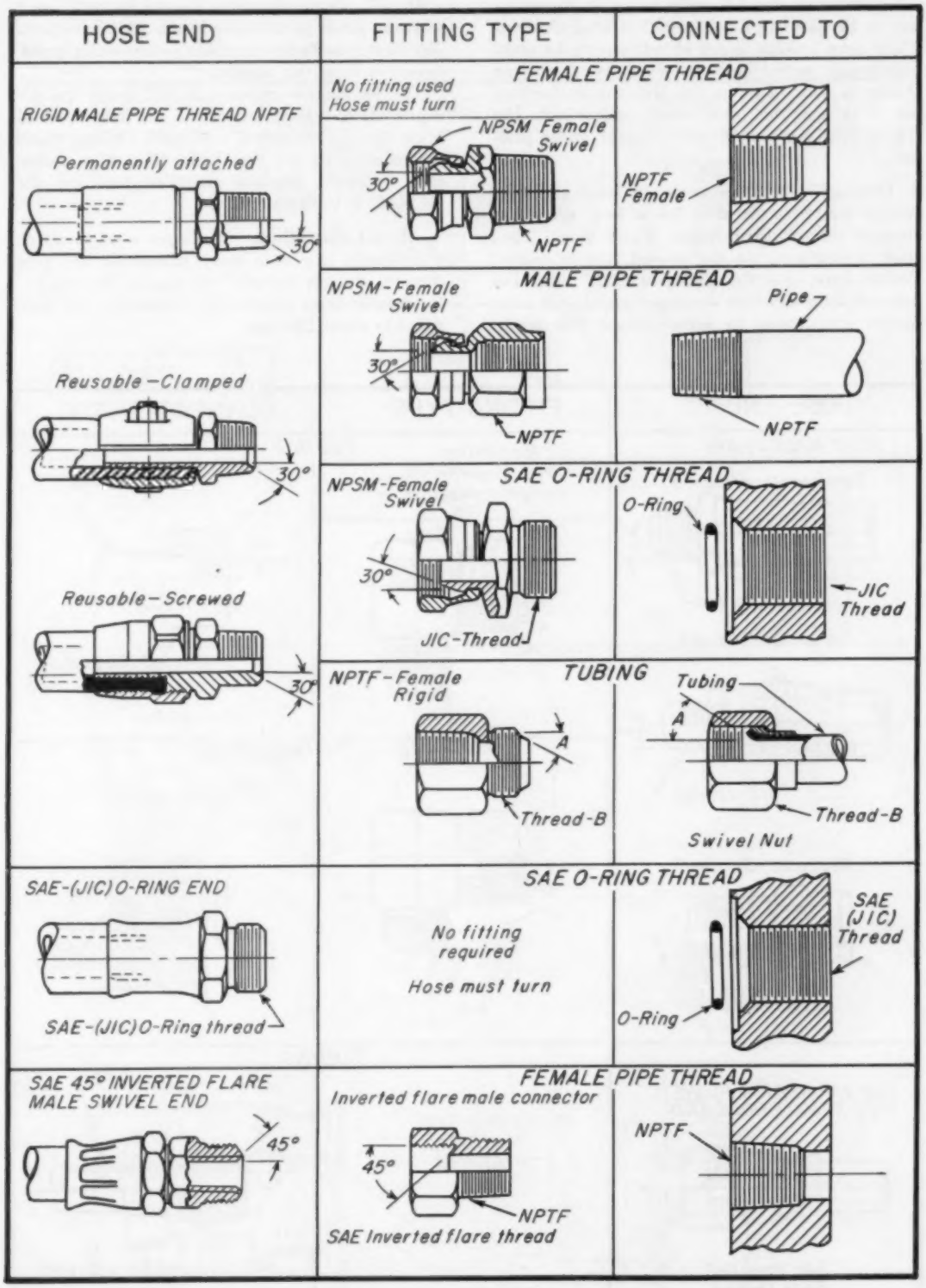
• **Hose Size**—Hydraulic hose size is generally based on ID. This applies mainly to the SAE



FLARE ANGLE-A	THREAD TYPE-B
45°	SAE—Thread for 45° flare
37°	UNF—SAE-Thread for 37° flare

standard hose types 100R1, 100R2, 100R3, and 100R4. Aviation, cotton-braid hose, type 100R5 is sized on an equivalent tubing ID. This type of hose requires its own hose-end fittings.

• **Hose Ends**—The best design for low-cost maintenance is usually with rigid, male, pipe-thread hose-ends. The swivel is then part of the port fitting, and this is simpler to manufacture than a



swivel hose-end. Furthermore it does not have to be replaced when the hose is changed. A complete line of all types of port fittings for this hose-end is on the market.

The rigid, male-flare is also a popular hose-end. Again, the swivel remains in the permanent fitting.

Sometimes to make it easier to get at, the swivel has to be part of the hose-end. On applications where some leakage is not objectionable, the male, pipe-thread, swivel hose-end which seals with an O-ring is used. This is the cheapest connection, but it is leakproof only when pressurized. The O-ring does not seal properly, except under pressure.

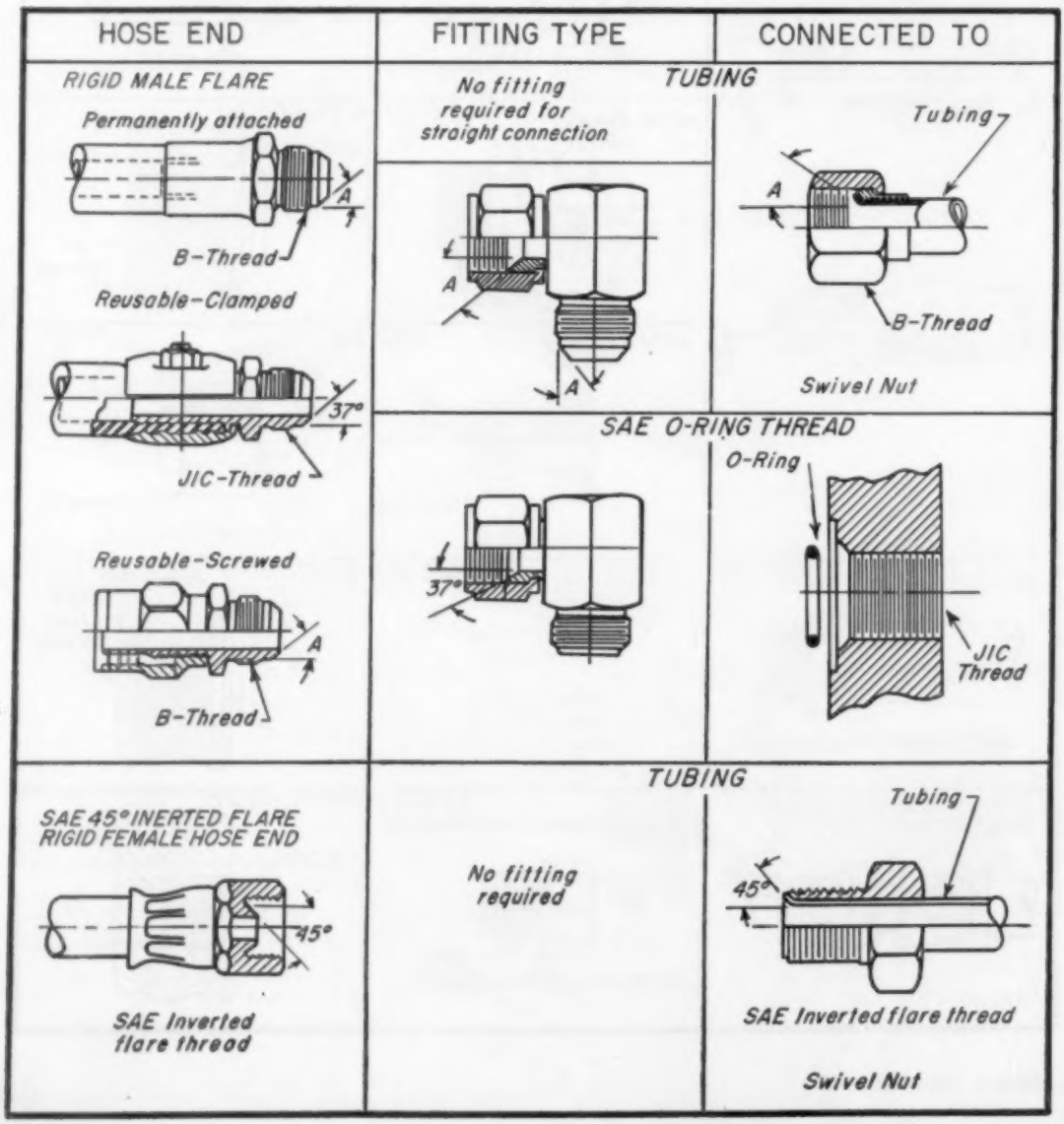
• **Fittings**—The flare angle on hose and tube fittings has been debated for a long time, and changed several times. Before World War II, two flare angles were on the market, the 30-degree, Parker flare, and the 45-degree SAE flare. The inverted flare was then developed mainly for automotive applications to permit closer line bends.

The standardization of military aircraft during the war brought a compromise flare angle of 37½ degrees. This has a longer sealing surface and less flaring distortion than the 45-degree type. This flare also avoids the danger of tightening deformation which is objectionable in smaller flare angles.

The 37½-degree flare was adopted by the JIC and was also made in alternate in the SAE Standards. The 30-degree Parker flare has now practically disappeared from the market.

The automotive industry is still using the 45-degree flare, mainly because of the lower cost of brass fittings compared with steel fittings which are required by JIC Standards. Most other industrial hydraulic machine manufacturers use the JIC-SAE 37½-degree flare.

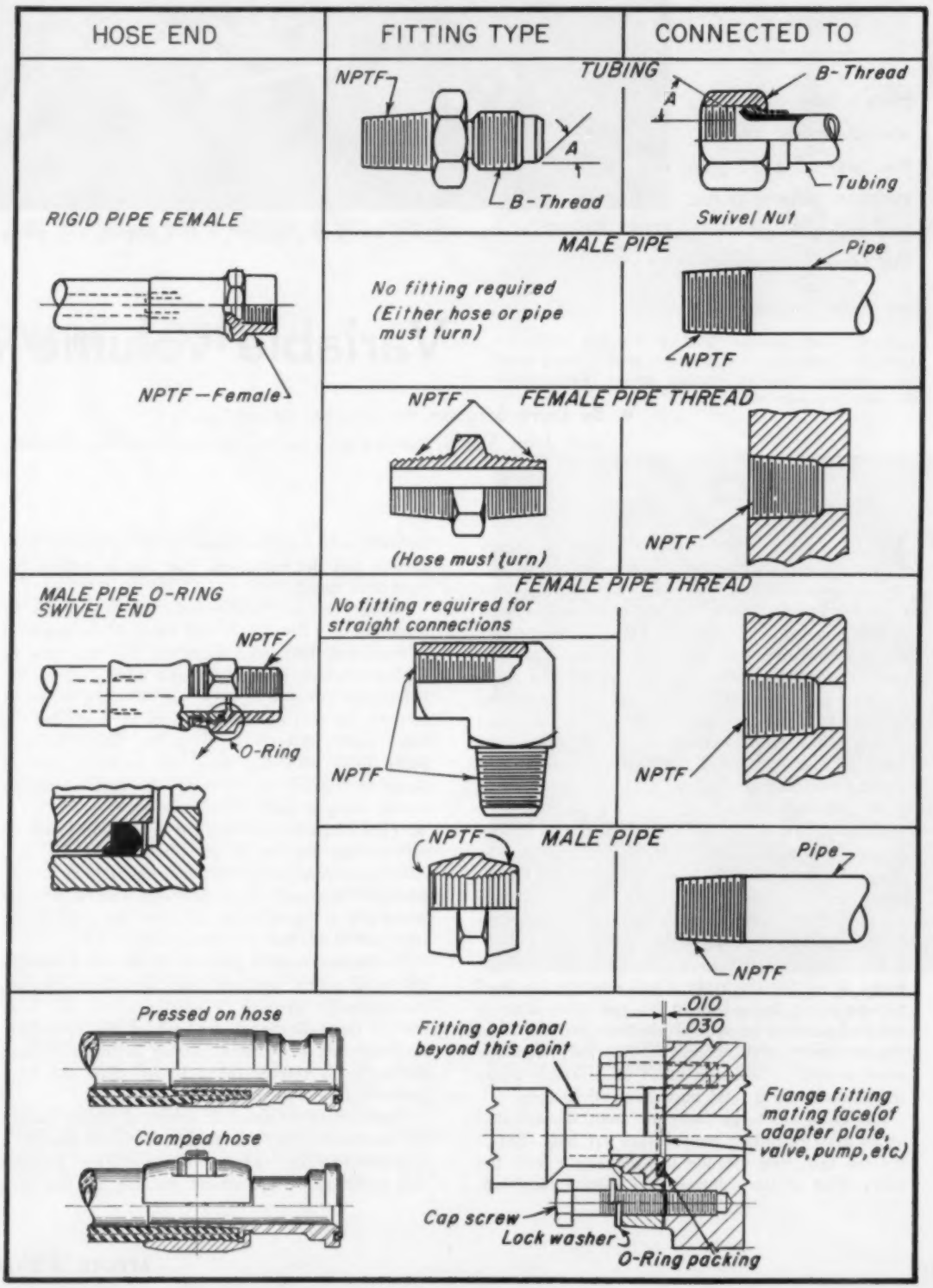
• **Port Connections**—The three ways to attach a hydraulic line to a body connection are pipe threads, straight threads, and flange. Dryseal (interference) type, pipe-thread connections are leakproof to about 1500 psi.



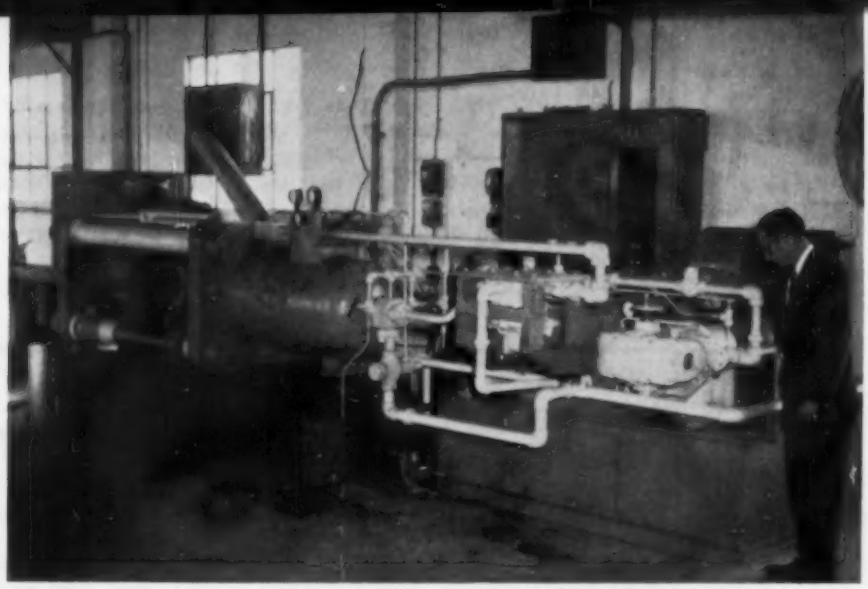
Disadvantages of pipe-thread connections are: a. importance of workmanship and tolerances of the pipe-thread dimensions; b. poor reusability; c. difficulty of adjusting outlet direction of angular adapters.

The disadvantages brought the development of a new thread for hydraulic fittings. It has been standardized in the SAE under the name of *SAE Straight Thread O-ring Boss Connection*. The manufacturing cost is a little higher than for the simple pipe thread, but straight thread connectors have many advantages, especially in stopping leakage. Undoubtedly this connection will be used more and more, especially as operating pressures increase.

In flange connections, generally used where pressures are high, an O-ring does the actual sealing. The O-ring is tightened to the component by a split flange. ▼▼▼



Here's how one company saved the cost of a 70-gpm variable volume pump and still got the same performance



FIRST MODEL in the extrusion press development is this 330-ton unit which is powered by . . .

Variable volume at

• By Larry Strosser, *Extrusions, Inc., Caldwell Twp., N. J.*
and John Sharp, *Denison Engineering Div., American Brake Shoe Co. Clarke, N. J.*

JUST the right force, at just the right speed, at just the right temperature are some of the factors in extruding stainless steel and titanium. Getting all of these together in one machine has been a development of Extrusions, Inc. The success of the machine they now have in operation is due partly to the electrically controlled hydraulic system.

This 330-ton machine is compact—measures only 11-ft long—and has a hydraulic power unit as big as the machine itself. The unit takes billets from 2 9/16-inch to 4 1/16-inch diameter and squirts them out in lengths up to 22 ft in about 3 sec. Run-out speed is 25 to 30 ft/sec.

Back of this amazing performance is a 150-hp hydraulic power system with two 35-gpm pumps driven by individual 75-hp motors. Infinitely variable delivery from 0 to 70 gpm was gotten at a low price by combining a fixed delivery pump with a variable volume pump.

For deliveries from 0 to 35 gpm, the variable pump is set for the right displacement with fixed volume pump unloaded. At 35 gpm, the pump is cranked back to its neutral position, and the fixed displacement pump is connected into the system.For more delivery, displacement of the variable pump is increased for a total maximum of 70 gpm.

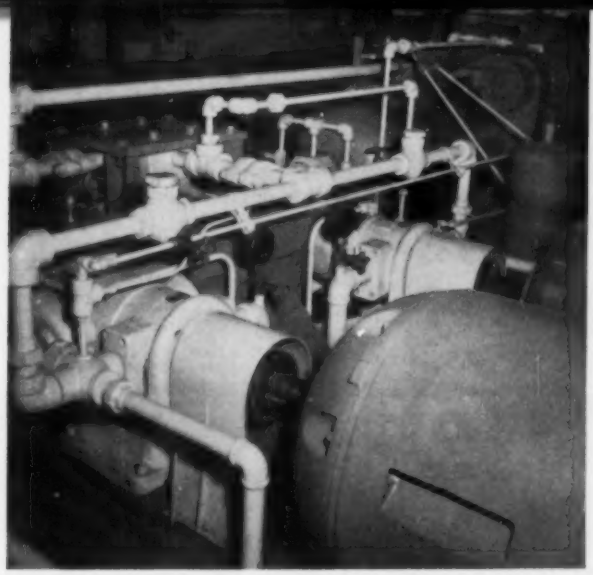
Extrusion has to be fast—the metal doesn't stay at its high extruding temperature for long. But if it's too fast, you extrude the die along with the billet. Part of the solution is a special lubricant-insulator which is continuously fed to protect both the die and the extrusion. The rest is getting the right ram speed.

Delivery of the fixed volume pump depends on actuation of a 2-way solenoid valve. If the solenoid is energized, the valve shuts off the vent line of a pilot-operated relief valve and setting of the relief jumps from 0 to 5000 psi. Finding it easier to push the ram at 4500 psi than to overcome the relief valve spring, oil from the fixed delivery pump joins with that from the variable delivery pump to extend (or retract) the ram according to the extreme positions of the 4-way valve.

• **Fast Return**—Getting rid of cylinder head-end oil without forcing it all through the 1½-inch directional valve is the answer to fast return. A 1½-inch pilot-operated check valve opens when pressure is applied to the rod end, and gives an alternate return path when the cylinder retracts.

The center, neutral position of the valve unloads the total pump delivery and also decompresses, automatically through a needle valve, the head end of the cylinder at the end of the operation. A timer in the electrical circuit prevents shifting the valve to retract the cylinder until the high pressure fluid has decompressed.

Pushbuttons mounted at a control pulpit control all functions. Referring to the electrical circuit, a JOG-SAFE-RUN, key switch selects operation. Turning this to the RUN position and pressing the two FWD



. . . two pumps piped in parallel. Variable volume pump is shown in foreground. Fixed volume pump is in back.

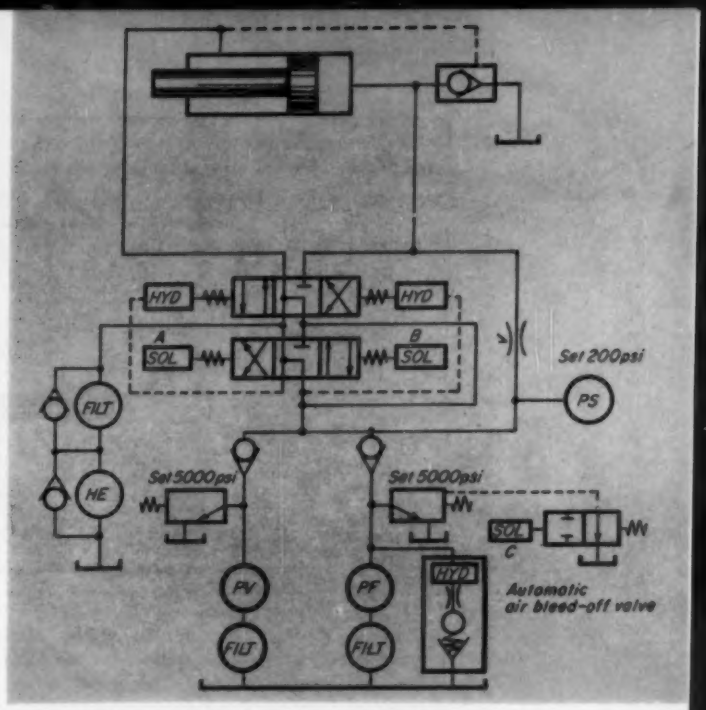
lower cost

pushbuttons energizes solenoid *A* to extend the cylinder.

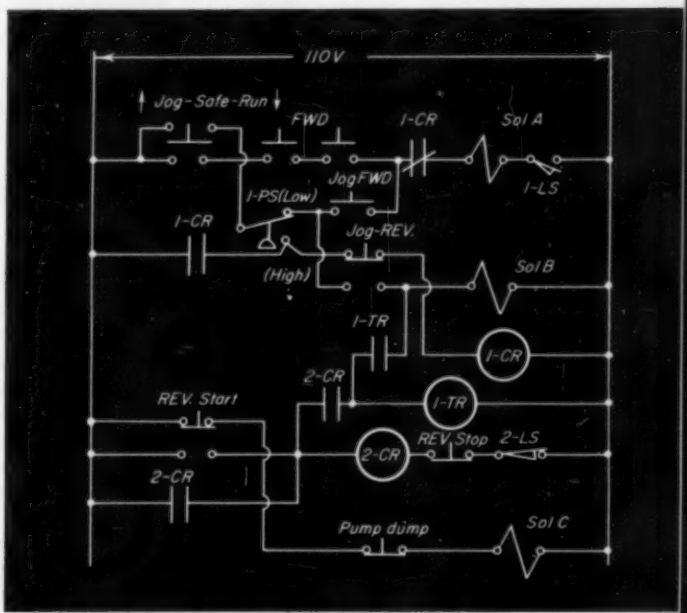
• **Electric controls**—A pressure switch in the jogging circuit prevents applying high force during jogging. This is set for 200 psi and connects power to the JOG-FWD and JOG-REV pushbuttons which energize solenoids *A* and *B* of the directional valve. If the pressure switch is actuated close to its *high* contacts, it energizes relay 1-CR which locks in through one of its contacts and also opens the circuit to solenoid *A*. The only way to de-actuate the relay is to press the JOG-REV switch to back the cylinder away from the obstruction.

Retraction of the cylinder is started and stopped by two pushbuttons. Starting the reversal de-energizes solenoid *C* and unloads the fixed volume pump, so that retraction of the cylinder begins with the output from only one pump. This slow start of the retraction stroke gives a clean breakaway of the extruding stem from the billet. When the REV-START pushbutton is released, solenoid *C* is again energized, so that both pumps deliver for fast retraction.

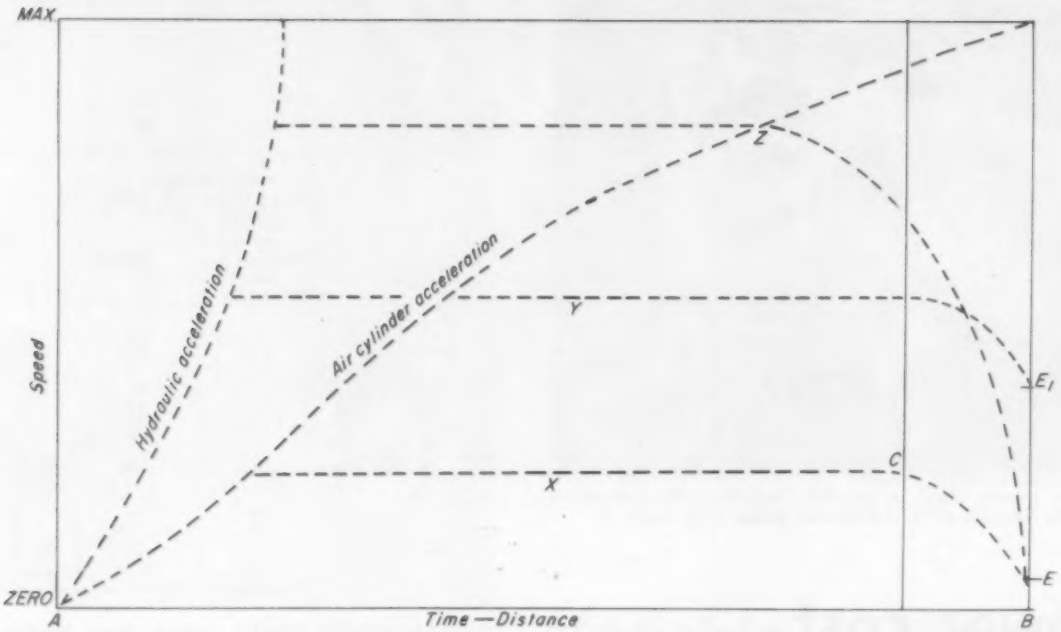
Relay 2-CR which is actuated by the REV-START button energizes time delay relay 1-TR. to insure time for decompression. At the end of the timed period, contacts of timer 1-TR close and energize solenoid *B*. Retraction is stopped and the circuit reset when either the REV-STOP button is pressed or limit switch 2-LS is contacted by the ram. ▼▼▼



VENTED RELIEF VALVE unloads fixed displacement pump when solenoid is de-energized. Variable displacement pump unloads through neutral position of directional valve which also provides decompression.



PRESSURE SWITCH in jogging circuit is actuated at 200 psi to prevent further jogging forward. JOG REV button must then be pressed to back off the ram. Timer keeps directional valve in neutral position for decompression before reversal.



GRAPH SHOWS acceleration and deceleration characteristics of cylinders. Hydraulic cylinders can accelerate only up to pump delivery. Air cylinders continue acceleration due to expansion of air as the load is overcome. Assuming C-E as the deceleration provided by a standard cushion, speed X cannot be exceeded if safe "slow" speed E is to be reached before the end of the stroke, if speed is increased to Y, there'll be a bang at E_1. For safe deceleration external cushioning to give speed Z must be used.

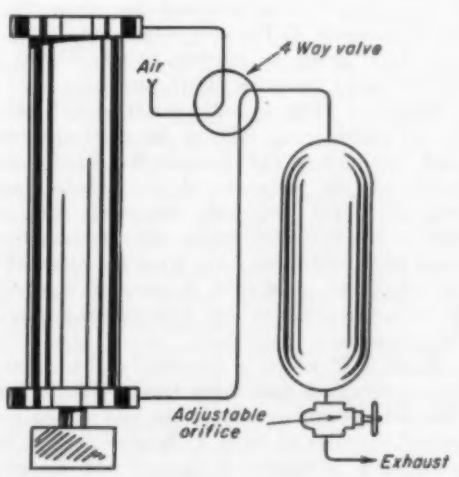
How to stop air cylinders smoothly

• By Elmer F. Heiser *S. G. Morris Co., Cleveland, O.*

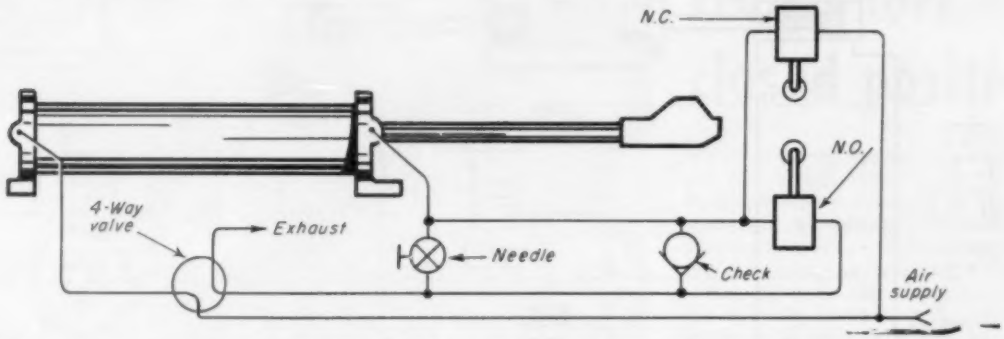
LET'S assume we missed the boat on our design and are unhappy with an air cylinder which has a standard cushion. To keep the cylinder from beating itself and the rest of the equipment to pieces we would have to limit the speed to curve X. This slow movement holds up the job. We want less creep and more snap as at Y or Z on the graph.

There are several possible answers, some very simple:

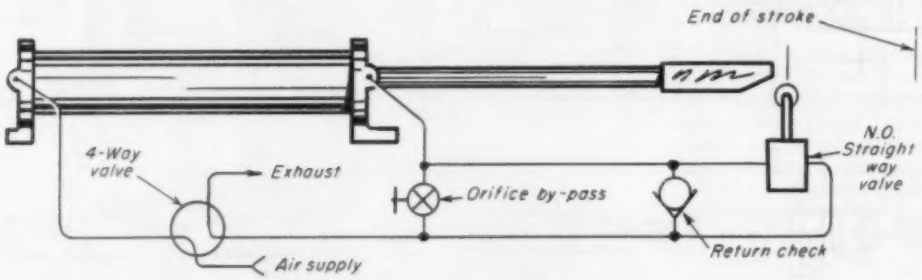
1 Instead of exhausting freely to atmosphere from the control valve, install a receiver on the exhaust with a controllable orifice to atmosphere. This arrangement provides an initial pressure drop due to the expansion of air into the bottle and allows the piston to accelerate. It then hurries to catch up to a back pressure balance point. Varying the bottle capacity and the orifice area will advance or retard the "catch-up" point of the piston. It is possible to adjust the orifice bleed-off so that the balance point—where back pressure equals the force—is at or near the end of the stroke.



2 Use a normally open straight-way valve in the cylinder line with an adjustable orifice bypass. The straight-way valve can be either cam or solenoid operated. It is closed at a point on the cylinder stroke to allow "trapping" a sufficient volume for compression to accomplish cushioning. Unless the straight-way is an unbalanced free moving poppet, it will be necessary to bypass it with a check valve for free reverse flow. Cam position can be altered to get the desired cushioning.



3 Use the same arrangement as in (2) but add a normally closed straight-way valve which admits a "burst" of line pressure after the normally open valve has closed. The cam length for the straight-way which admits pressure can be quite short, and its position in relation to the point at which the normally open valve closes may be varied. The addition of air at pressure for cushioning makes Boyle's job easier. This provides deceleration at any point in the cylinder stroke.



Limitations—Each of these external cushioning circuits has saved the day on various installations. Regardless of any difficulties which may arise, there are some jobs where one of these circuits may be the only practical answer.

There is always a possibility with some air cylinder installations that unusual or "stalling" resistance will occur during the stroke due to friction, load shifts, obstructions, etc. When such resistance is encountered and the piston slows or stops completely, the relationship of "work" pressure and exhaust or back pressure changes. Keep in mind that the exhausting of air continues while the piston slows down or stops. If the arrangement as in (1) or (2) is used and adjusted for what appears to be normal operation, stalling or stopping can upset the apple cart.

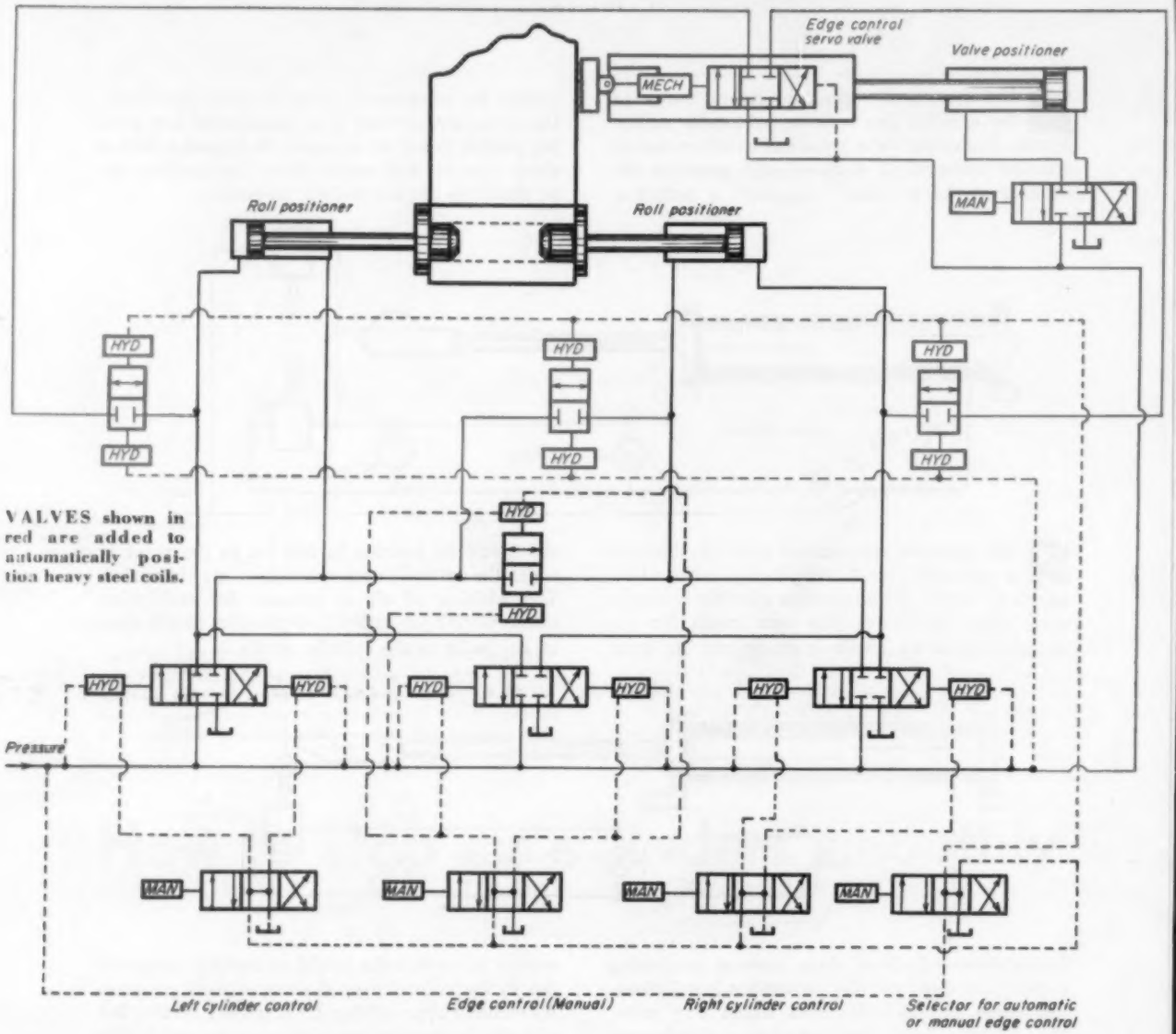
Normal adjustment operation is based on the piston in motion with some back pressure on the exhaust side, and with work pressure probably reduced below line pressure due to expansion during normal acceleration. In the stall or near stall condition, work pressure will rise and back pressure will drop. When and if the resistance is overcome, the piston will take off on a sharper acceleration curve than the initial or starting movement due to the reduction or absence of back pressure. A condition approaching Z (in graph) results, but with the deceleration curve advanced toward B (the (end of the stroke). Some deceleration may occur but it can be too little and too late.

Arrangement (3) partially overcomes the stall and take-off condition described as it recharges the exhaust side of the cylinder with line pressure and does not depend completely upon compression of the trapped "residual" air.

Both arrangements (2) and (3) depend upon the action of valves for operation. If solenoid valve are used, electrical failure can erase the cushion completely. Should it be necessary to make an installation based on limit switches and solenoid valves, it may be advisable to provide safety interlock or dual elements (two valves in series, two parallel limit switches, etc).

Failure of cam or mechanically operated valves can occur also, but with reasonable maintenance the probability can be minimized. ▼▼▼

This article is taken from a chapter in Elmer Heiser's book, Air and Oil Cylinders in Industrial Applications, published by APPLIED HYDRAULICS.



Use a full hydraulic servo for edge control

STEELMAKERS have an edge control problem when they feed stock off one coil, through a rolling mill and onto a take up reel. Without some positioning mechanism, rewinding would be impossible because the sheet has so much lateral movement.

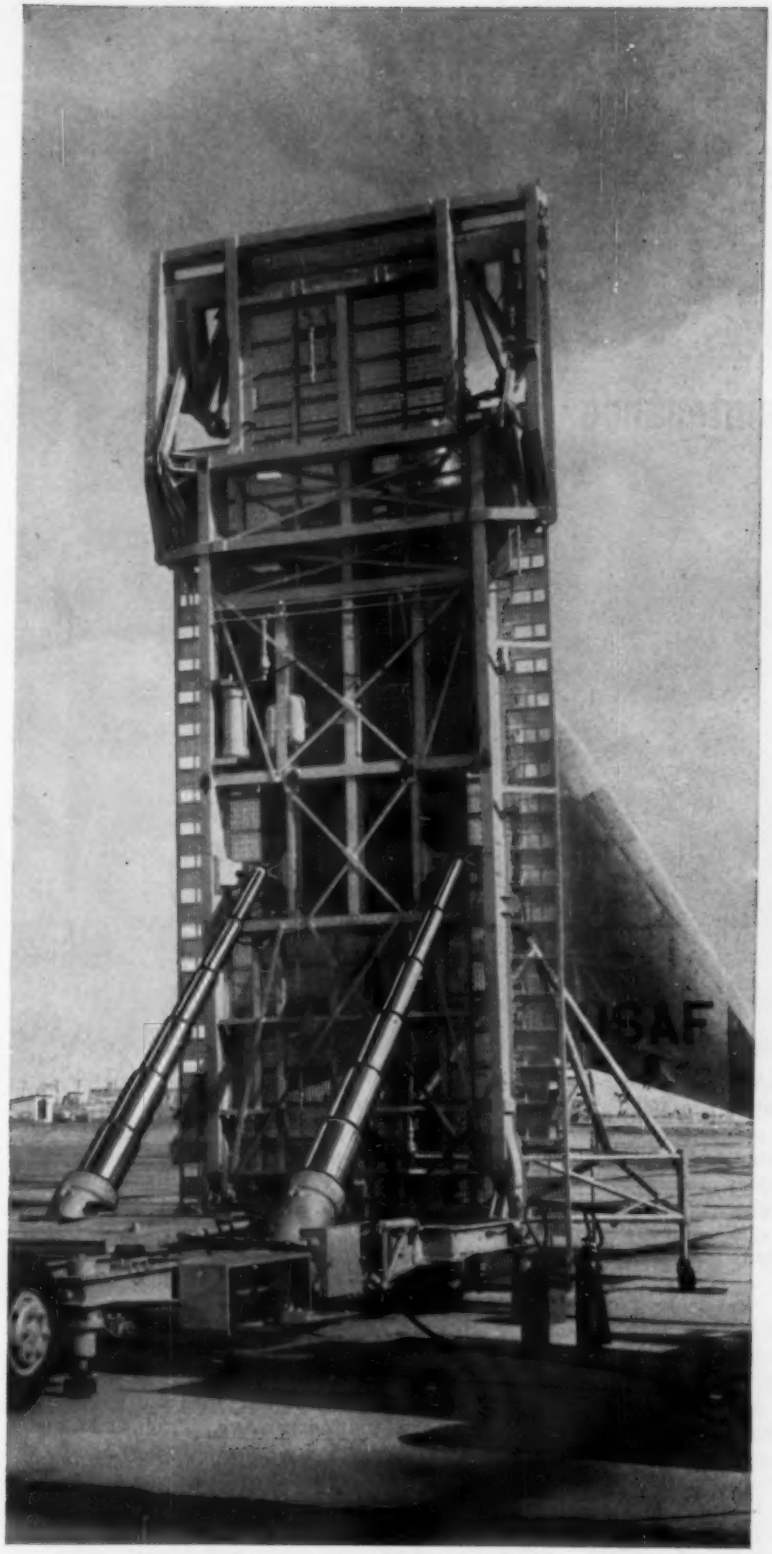
The circuit, above, shows two designs used on rolling mills in a Cleveland steel plant. The manual control circuit is shown in black. This setup calls for continuous attention of an operator to shift the coil in either direction by working the manual edge control valve. With mill speeds up to 2700 ft/min, this means of edge control works. But the results aren't always good. The coil on the takeup reel can have a very rough edge.

An automatic control, shown in red, positions the roll within ±1/16 inch. The servo valve, with sharp lands to give fast response, is mounted on a moveable plate which is hydraulically positioned to "null" the valve.

All valves in this circuit are mechanically or hydraulically positioned. No springs are used.

Coils, having diameters to five feet, are 28 to 92 inches wide. Stock thickness is about 0.20 to .109 inch. To handle these heavy coils, 12 inch bore positioning cylinders are powered by 750 psi oil. ▼▼▼

Information supplied by Almar Hydraulic Valve Co.



ALL CYLINDER COMPONENTS are structurally designed to withstand a shock impact load equivalent to a 3G landing of the aircraft. Stroke of the bed raising cylinders is 152½ inches; trunnion to pin eye centers, 179 inches extended—26½ inches closed. Cylinder inside diameters range from 14 inches in the mains to 5¾ inches in the smallest sleeves.

Hydraulic high-stretch from short closed position

THIS 9000 lb. vertical "landing field" and the aircraft riding piggy back are hydraulically positioned in just 3½ minutes by the two large COMMERCIAL six-stage telescopic cylinders. They stretch out over 10½ feet in playing a key role in the successful takeoff and landing of the U. S. Air Force Ryan X-13 Vertijet. In returning from vertical to horizontal position a double acting control in these cylinders enables the bed to be pulled over the center of gravity. Special features built into the first and sixth stages set up this unique operation. Once past the center of gravity, the cylinders return to their closed position by the weight of the bed and aircraft.

Here was another application problem that COMMERCIAL'S versatility in fluid power engineering helped to solve. If you have a fluid power problem involving pumps, valves, motors or cylinders, perhaps we can come up with the solution quickly and economically. Address inquiries to The Commercial Shearing and Stamping Company, Dept. A-23, Youngstown 1, Ohio.

CABLE ARM operating and cable tensioning cylinders, trailer outrigger jacks and two sizes of pumps to generate the fluid power for the hydraulic system were also furnished by COMMERCIAL.

COMMERCIAL
shearing and stamping

as NEW *as* TOMORROW...

VALVAIR plug-in valves cut assembly and maintenance costs!

Model PA-121

Built-in plugs and connectors in Valvair's new ¼ in. Speed King 4-way control valves complete electrical circuits *automatically* . . . reduce assembly and maintenance time to a cost-cutting minimum! Permanent electrical connections are made in manifold or sub-base at assembly . . . then valves and pilots are plugged in . . . bolted down. There's no need to disturb equipment wiring for quick in-service maintenance!

Navy M bronze and stainless steel components assure 20 million cycle-plus dependability. Interchangeable pilot, with coil guaranteed against burn-out for life of valve, fits any plug-in Speed King. Coils for ac or dc, any voltage . . . 35—200 psi range . . . optional manual over-ride . . . ¼ in. cylinder ports . . . 2 or 3 station manifold with common inlet, exhaust and conduit ports, or sub-base mounted . . . valve meets JIC standards!

Whether you build or operate machines, you'll find that Valvair plug-in control valves set new standards of adaptability, performance and economy! Valvair Corp., 454 Morgan Ave., Akron, Ohio.

AA-5660

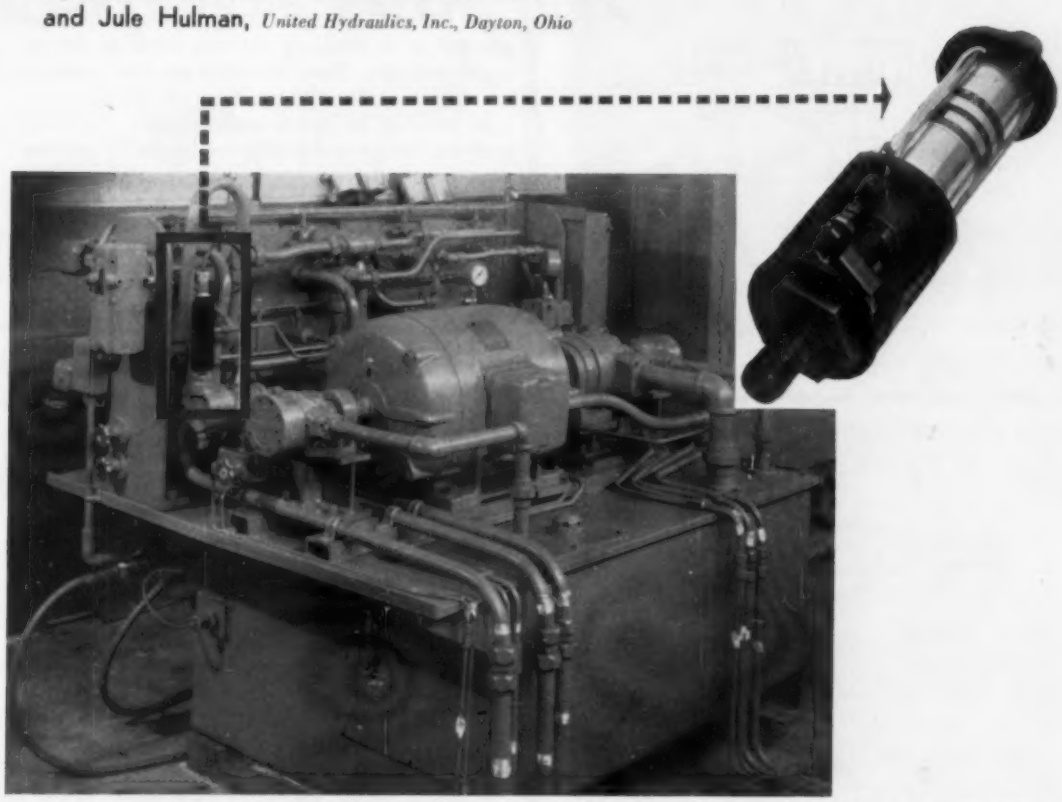
RESEARCH...
PROGRESS...
LEADERSHIP...

Representatives in principal cities.

CIRCLE 120 ON READER SERVICE CARD

Motorized relief valve for remote control

• By Z. Frederick, *Chief Engineer, Cyril Bath Co., Solon, Ohio*
and Jule Hulman, *United Hydraulics, Inc., Dayton, Ohio*



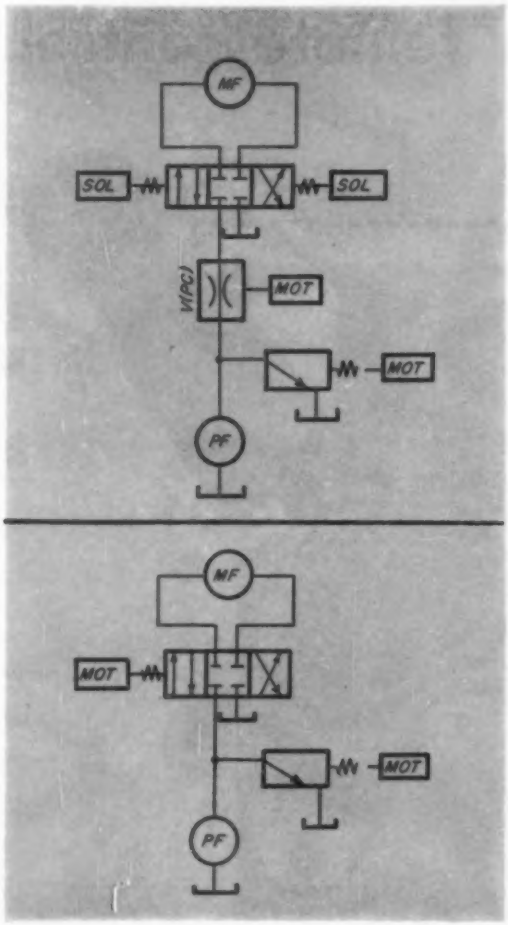
Here's how a miniature, 28-volt, d-c motor is used for remote adjustment of relief valve setting. There are also many other ways of applying this motor-driven device to directional and flow control valves for infinitely variable, remote control.

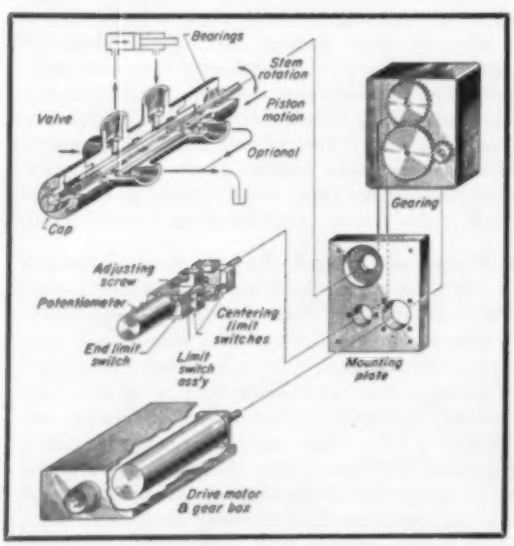
A MOTORIZED relief valve actuator has been used recently by the Cyril Bath Company for control of their radial draw former machine. This machine has a large hydraulic cylinder to maintain tension on the work as it is being formed. The cylinder operates in a stalled condition, so the tension on the work is controlled by adjusting a relief valve. Usually, best results are obtained when the work is stressed to the yield point, or slightly below. This refinement requires accurate and easily adjustable control. The cylinder pressure must be adjusted according to work shape and material.

In early draw formers the relief valve was mounted in the fixed control station and set manually with a handwheel. Control was good, but larger machines, built to accommodate larger dies, required a remote control pulpit. The first method of remote pressure control was to use a vented relief valve at the pump with a small line to a pilot relief at the remote control station.

• **Electrical Control**—Because of added features in the most recent machines, a portable control station is now used. Electrical controls replace hydraulic controls, and the wiring simplifies former piping requirements. Originally, electrical control of pressure was accomplished by a small rotary hydraulic actuator driving a cam to change settings of a pilot relief valve. The rotary actuator was controlled by a 4-way, solenoid valve actuated by pushbuttons at the control station. Although this arrangement worked well, there was some creep of the actuator after releasing the pushbutton, so that fine control was difficult to get.

MOTORIZED RELIEF VALVES





A faster and more precise adjustment is now made with a 28-volt, d-c, motor-driven actuator mounted directly on the relief valve and controlled by a toggle switch at the control station. Four active positions of the toggle switch provide two motor speeds in each direction. Limit switches within the actuator limit the number of revolutions in each direction to fix preset maximum and minimum pressure settings. These limit switches are actuated by a traveling nut and screw in the actuator assembly. These actuators are now available for mounting directly on standard valves.

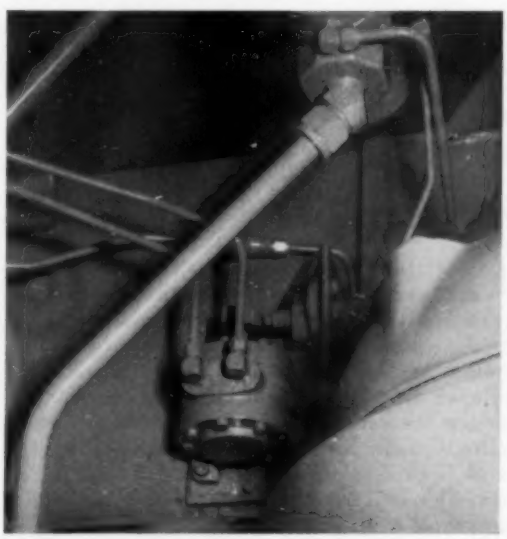
In addition to speed and accuracy in setting pressure, the d-c motor-actuator is smaller and less

Concluded on page 90

MOTORIZED VALVES control pressure, direction, and flow in these circuits. In the meter-in system at top, motors are electrically interlocked with the solenoids, so that the directional valve cannot shift until the flow control is closed. This prevents shock in shifting the closed center valve. The relief valve can also be electrically interlocked to unload the pump when the directional valve is shifted to neutral.

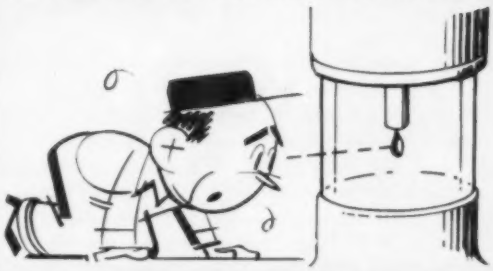
In the lower circuit, a motor has been applied to the directional valve. This gives controlled speed shifting, intermediate positioning, and speed control. Motorized directional valves are driven through gears as shown in the diagram below. One spool-type model which has been developed, controls flow from a few drops a minute to 20 gpm. A spring in the valve reduces backlash, and the spool is sealed against leakage at the drive end by an O-ring. A limit switch assembly which can also mount a potentiometer for valve position feedback is geared to the motor.

ROTARY ACTUATOR which cam-operated a pilot relief valve was part of original system for electrically controlling pressure. Solenoid valve controls rotation of actuator in either direction to increase or decrease pressure.



DON'T WASTE TIME ON THE

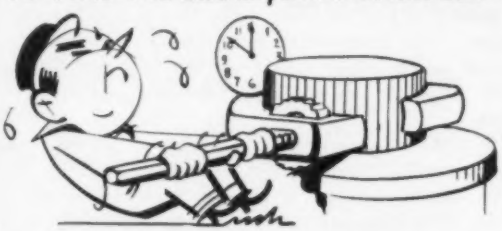
LUBE IN THE TUBE



JUST GLANCE *AT THE*

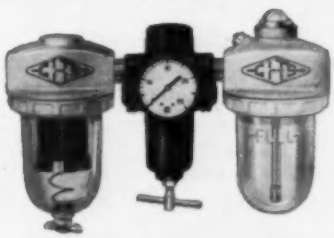
FOAM IN THE DOME

NO NEED TO STOOP OR SQUINT OR SQUAT,
TO FIND THE SMALL, DIM VIEWER SLOT...



TO CHECK THE DROPS, DON'T SET TOO FAST,
THE OIL SUPPLY WILL NEVER LAST...
NO TINKERING, NO WASTE OF TIME,
TO SET THE METER SUPER-FINE!

A SHORT GLANCE QUICKLY VERIFIES
THAT OIL IS ACTUALLY ATOMIZED...
GITS MIST-A-DOME IS LARGE AND CLEAR,
A SNAP TO CLEAN OF SMUDGE AND SMEAR.



FOR AIR LINE LUBRICATION, GET
THE DOPE ON GITS COMPLETE MATCHED SET.

THIS NEW FREE CATALOG TELLS MORE,
YOU'LL FIND ADVANTAGES* GALORE,
SO TELL US THAT YOU WANT DETAILS,
WE'LL DROP IT PRONTO IN THE MAILS.

GITS

BROS. MFG. CO.

Pneumatics Division

1846A South Kilbourn Avenue, Chicago 23, Illinois

*Reduced Inventory, Minimum Pressure Drop, Increased Lubrication Flexibility and many more.

Pressure cycling circuits

• By J. R. Fawcett

Components which will hold a steady pressure may fail quickly if the same pressure is applied intermittently. Hydraulic equipment built for low weight is most likely to fail because of pressure pulsations from pumps and actuators.

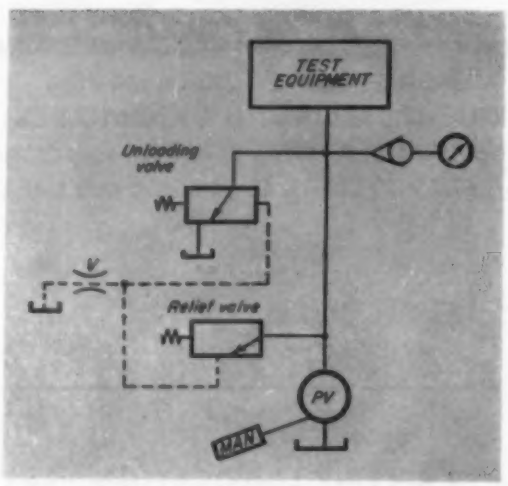


FIG. 1. THIS SYSTEM cycles pressure between maximum and zero. Frequency depends on pump output and flow control valve setting.

TWO TESTS check strength of a component under pressure cycling. In one, the pressure drops to zero each cycle; in the other, the pressure oscillates between fixed limits.

The first test is illustrated by the circuit of Figure 1. A spring-loaded relief valve, preferably of the piston type, is connected to an unloading valve. An adjustable needle valve is connected in the pilot line between the two valves. When the pressure rises to the value set on the relief valve, the valve opens and applies system pressure to the unloading valve. When this valve opens, system pressure drops. The relief valve then closes, trapping fluid in the control line to the unloading valve. The unloading valve remains open as system pressure falls to zero. When enough fluid has leaked through the needle valve, pressure in the pilot line falls below the setting of the unloading valve. The valve closes and the cycle is repeated. The speed of operation depends on the pump output and the setting of the needle valve. Speeds of 1500 cycles/min. are easy to get.

The pressure gage measuring peak pressure must be connected through a check valve to prevent impulse damage. Another way is to adapt an indicator for measuring pressures in diesel engine injection systems. An oscillograph is excellent for measuring the pulsating pressure.

The second test between fixed pressures cannot be done so rapidly. The method shown in Figure 2 operates at 200 cycles/min. An air-hydraulic

Continued on page 89

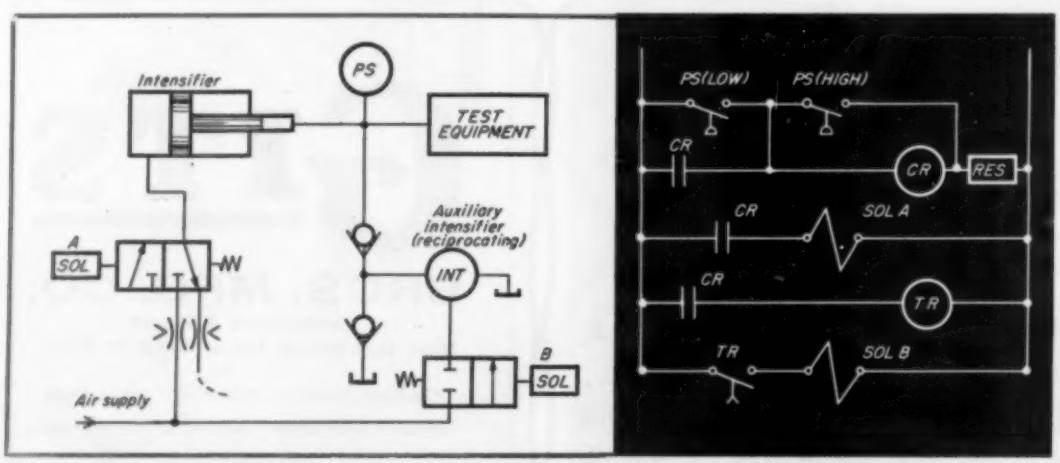
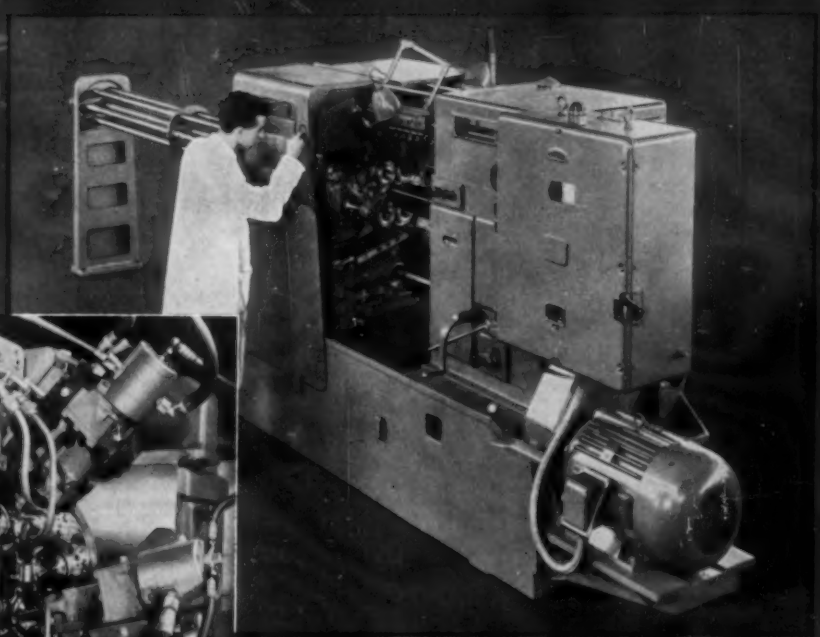
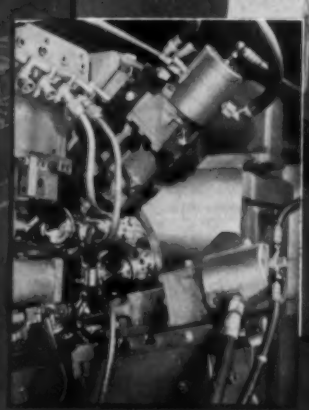


FIG. 2. THIS AIR-POWERED system cycles pressure between maximum and minimum limits. Auxiliary intensifier makes up leakage.

FOR EFFICIENT POWER TRANSMISSION

Keelavite HYDRAULICS



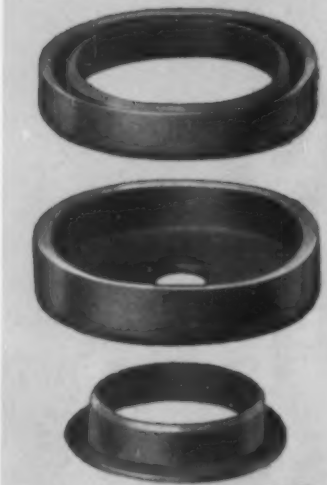


A comprehensive standard range of hydraulic power and control equipment backed by circuit design.

KEELAVITE ROTARY PUMPS & MOTORS LTD., ALLESLEY, COVENTRY, ENGLAND

Telephone: Meriden 461

THE RECOGNISED AUTHORITY ON HYDRAULIC POWER TRANSMISSION



Cup Seals

by

LINEAR

in Viton A, Vyram, Polyurethane, and other unusual elastomeric materials having excellent resistance to many petroleum oils, synthetic lubricants, fuels, phosphate and silicate ester fluids—in a temperature range of —40° to + 500°F.

LINEAR—specialists in close-tolerance molding in all of today's modern polymers . . . in both fabric reinforced and homogeneous materials.

These are low friction seals. For further help, call the LINEAR engineer.

"PERFECTION IN RUBBER"

LINEAR

LINEAR, INC. STATE ROAD & LEVICK ST. PHILA 35 PA

Air cylinders make press double acting

● Bert Kepple, *Day-Bright Lighting, Inc., St. Louis, Mo.*
and Ralph Williams, *The Bellows Co., St. Louis, Mo.*

TO MAKE a standard eccentric drive press double acting is usually expensive. Here is a method worked out that really saved cash. For a press manufacturer to convert the unit it would cost $8000. These people did it themselves for $1000.

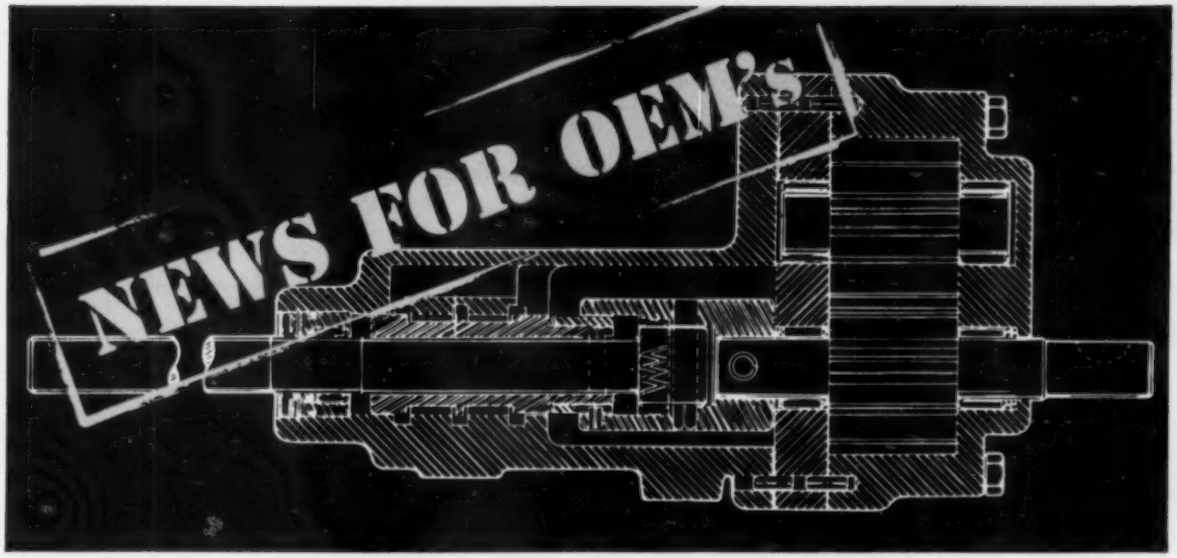
The problem was to design a method of holding the work in place while forming, then release it quickly when the die is raised. First springs were tried but they tended to straighten out the work after forming because they maintained pressure on the work after the die was lifted.

Air cylinders seemed the answer since they could be released quickly when the ram is raised and the holding force on the work could be regulated easily.

Two short stroke air cylinders were mounted on the front of the press slide and two on the back.

Elaborate means of synchronization were not needed since the cylinders had such a short travel. To limit air line length, two 4-way valves were used, each controlling two cylinders. Air lines to cylinders on both sides were accurately measured to insure all cylinders would extend together. Universal joints between the piston rods and the holding platen compensate for any slight non-synchronization.

The ram and the holding cylinders are actuated together by the start switch. The air cylinders extend first due to their more rapid acceleration. Downward movement of ram trips a limit switch, starting a timer that times out to retract all cylinders and ram simultaneously after completion of the work stroke. ▼▼▼



Behlen

NOW! *Expanded production makes* HYDRAULIC SERVO MECHANISM

available to MORE original equipment manufacturers

Originally known as the Behlen Powr-Steer, this advanced rotary type hydraulic servo mechanism has proved highly successful on thousands of farm tractors of many models and makes. Behlen was first to offer power steering for row crop tractors, five years ago. For the past two years, Powr-Steer has been used on a leading farm tractor line as original equipment. Demand soon outstripped our production capacity.

Now Behlen production facilities have been expanded to the point where we can offer our Hydraulic Servo Mechanism to a wide field of manufacturers of industrial heavy construction and agricultural equipment. From tractors to earth-movers. From fork-lift trucks to power shovels — every type of equipment where manual labor needs to be reduced.

In supplying the hydraulic "muscle" of Behlen's servo mechanism to your product, you will add magic to its sales appeal.

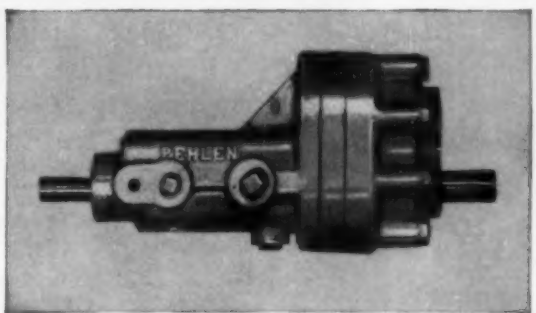
We invite you to see how easily the Behlen Hydraulic Servo Mechanism can be applied to your products as original equipment (or as extra equipment readily installed in the field). Your request (which will not obligate you in any way) will receive the personal attention of our production manager, Howard Christenson.

Phone, write or wire

BEHLEN MANUFACTURING COMPANY

Dept. AH-6 Columbus, Nebraska

World's largest manufacturer of tractor and grader power steering



The Behlen Hydraulic Servo Mechanism, Rotary Type, Series 2000, can be used for power steering or wherever a rotary servo motion is required. Controller and actuating parts are in one compact unit, for economy and simple installation.

FULL 360° OPERATION

The Behlen unit is a gear-type hydraulic mechanism (in contrast to the piston type on passenger cars and other equipment). The power source in the unit is a gear motor that will provide continuous 360° turning under full power in either direction.

The power unit is mounted anywhere along the steering shaft. While the Powr-Steer operates as a servo mechanism between steering source and wheels, it also blocks and controls wheel shocks. Does not affect steering ratio. Maintains full and positive control through mechanical linkage in event of hydraulic power failure.

Specialized engineers in our Hydraulic Division are ready to adapt Powr-Steer to your specific needs in any of hundreds of machinery and equipment applications.

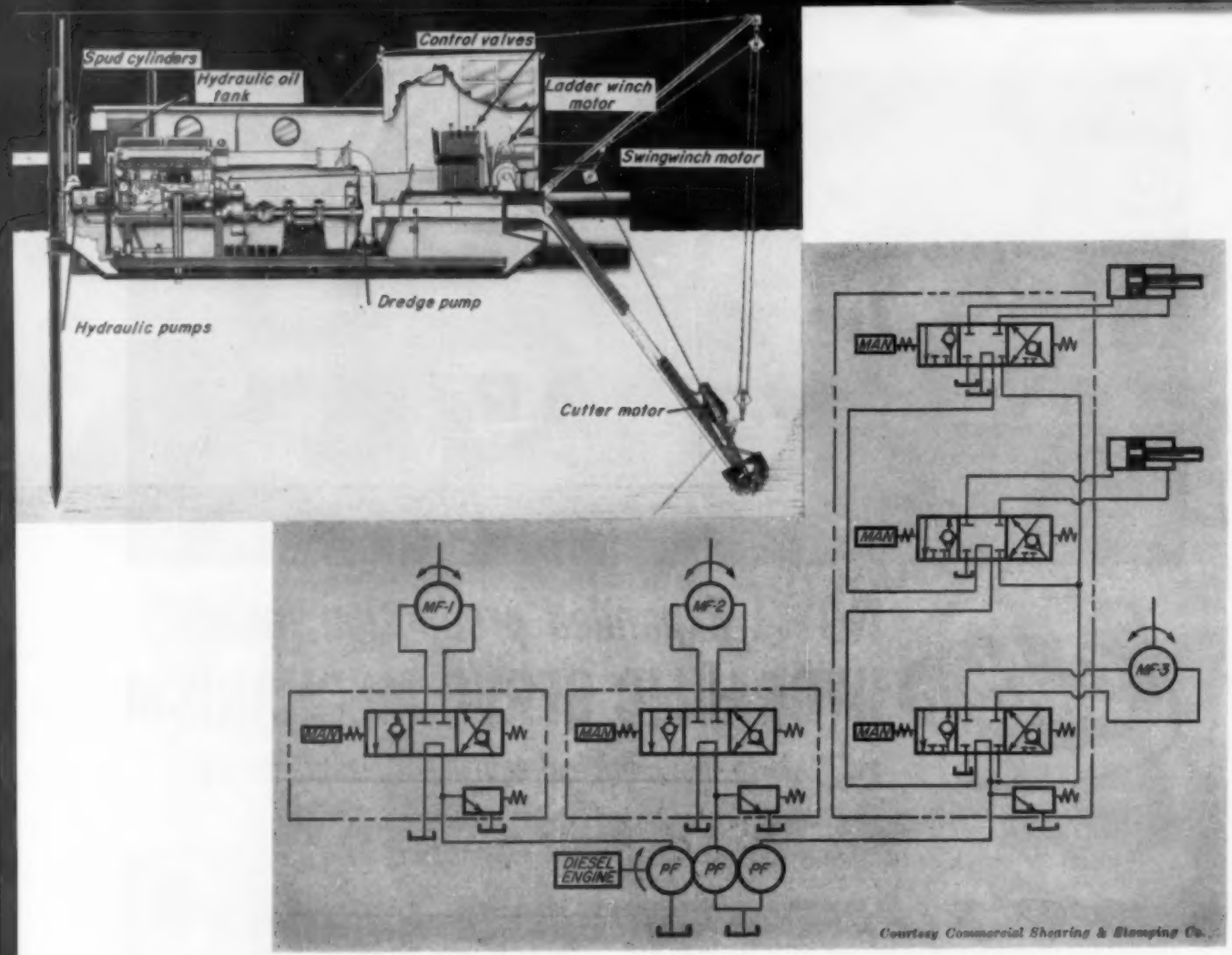


FIG. 1. CUTAWAY VIEW of the all-hydraulic Dixie Dredge shows the hydraulic system. Cutter loosens the bottom; the large, centrifugal dredge pump then pumps water and loosened material through a large intake pipe and discharges it through a pipe line.

FIG. 2. HYDRAULIC CIRCUIT diagram of the all-hydraulic dredge. A three-spool bank valve has one external port for pressure, one to tank and six to the actuators. All interconnecting porting is internal.

Underwater fluid motor powers dredge cutter

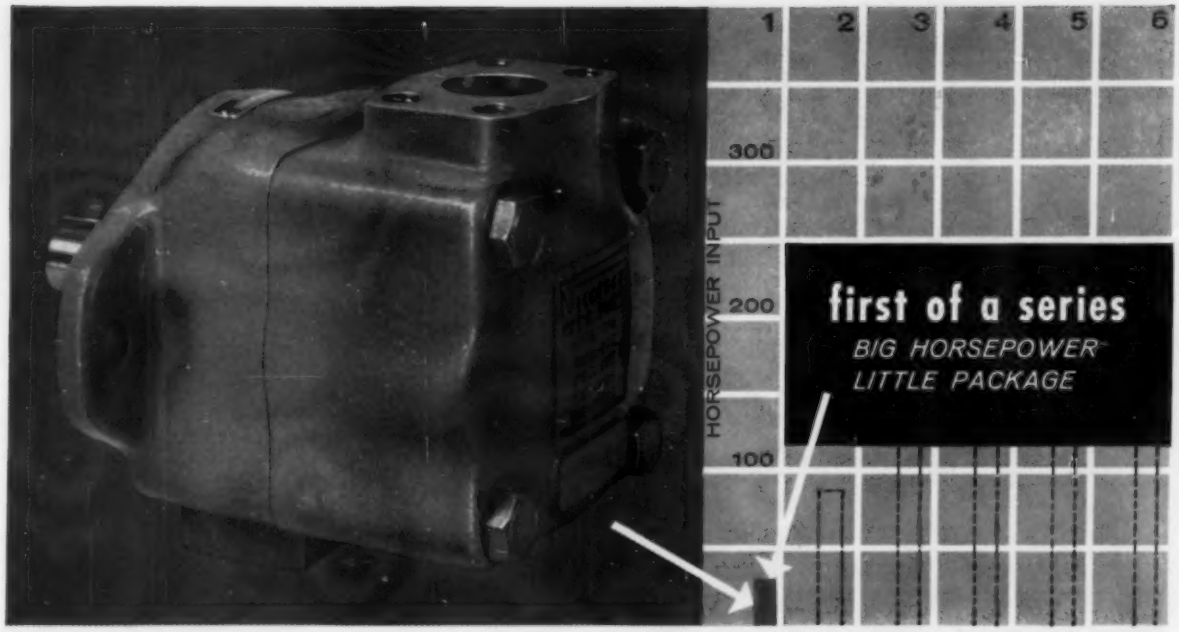
• By John H. Milne *President, Service Machinery Corp., North Miami, Fla.*

and Albert A. Miller, *Manager Product Sales The Commercial Shearing & Stamping Co., Youngstown, O.*

HYDRAULIC motors drive the cutter head, swing winch, and ladder winch, and hydraulic cylinders raise and lower the spuds on a recently developed dredge, Figure 1.

The outstanding advantages of the hydraulic system are less operator fatigue and the ability to deliver more power to the cutter head with fewer components. Operation is easy because the hydraulic controls are easy to operate and are all con-

Continued on page 89



NEW VICKERS® high performance vane pump

• high speed • high pressure • high efficiency • high service life

NEW COMPACT DESIGN . . . more than twice the horsepower of previous pumps in the same package size.

NEW VANE CONSTRUCTION . . . positive vane tracking at all speeds assures efficient operation at increased speeds and pressures.

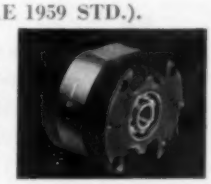
NEW SIZES not previously available . . . answers mobile equipment designers' need for greater hydraulic horsepower in limited space.

NEW PARTS INTERCHANGEABILITY . . . many common parts for single and double pumps (two pumps on the same shaft in one envelope). Lessens inventory requirements.

NEW 4-BOLT SAE FLANGE CONNECTIONS . . . will also accommodate user's 2-bolt flanges of the proper design.

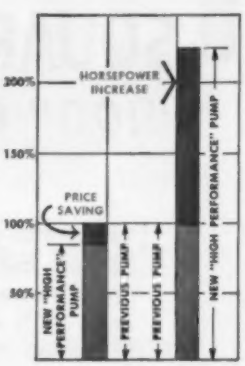
NEW 2-BOLT MOUNTING (SAE 1959 STD.).

NEW REPLACEABLE PUMPING CARTRIDGE . . . all wearing parts of pump are incorporated in one replaceable cartridge. Easy field replacement without removing pump from its mount. Cartridges available in kit form.



MORE HORSEPOWER PER DOLLAR. The graph at the right makes a revealing comparison between this new pump and a previous pump of the same rated delivery. The new Vickers "High Performance" pump provides more than *twice the horsepower* at *less cost* while shrinking package size from 200 to 112 cubic inches.

The complete line of "High Performance" pumps (both single and double) is being readied for release. Size range will accommodate your largest requirements. This first model of the series is available in three ring capacities; 12 gpm, 14 gpm, and 17 gpm as shown in table below.



Model Number	Delivery-GPM 1200 RPM 100 PSI	Delivery-GPM 2000 RPM 2000 PSI	Input Horsepower @ 2000 RPM 2000 PSI	Package Size†	Weight
2V12A-**10	11.8	17.8	25.5	L. 5⅛" W. 4⅝" H. 5¼"	26 Lb.
2V14A-**10	13.6	20.4	29.0		
2V17A-**10	16.6	25.2	36.0		

†Exclusive of Shaft Extension and Mounting Lobes

8050

Write for new illustrated Bulletin No. M5108 for further details and performance characteristics.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Mobile Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
Department 1474 • Detroit 32, Michigan

Application Engineering Offices: • ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.) PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) PORTLAND, ORE. • ROCHESTER • SAN FRANCISCO AREA (Berkeley) SEATTLE • ST. LOUIS • TULSA

FACTORIES ALSO IN AUSTRALIA, ENGLAND, GERMANY and JAPAN
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto, Montreal and Vancouver

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

RIVETT SQUAREMASTER "100" CYLINDERS

Unfailing POWER for MILLIONS of cycles!

Here's sure power for unfailing cylinder operation. SQUAREMASTER 100's are the world's finest constructed cylinders—perform with 100% efficiency! 200 P.S.I. air to 500 P.S.I. oil. Available in 7 mountings with standard dimensions, in 10 bore diameters, internal and external threading. Special models and cover combinations. Priced competitively; prompt delivery; meet all J.I.C. requirements.

RIVETT, INCORPORATED

Dept. AH-6, Brighton 35, Boston, Mass.

*Initial High Coefficient of Static Friction

POWER-PACKED FEATURES PROTECTED BY POWER-GUARD CONSTRUCTION

1. Piston rod. Ground and polished alloy steel. Hard chrome-plated. **2.** Piston rod bearing. Replaceable cartridge-type. **3.** Piston packing adjusts automatically. V-block packing minimizes friction. **4.** Correctly stressed tie rods. **5.** Cushion bushings. Bronze, floating type. **6.** Ports rotated to any 90° position. **7.** Steel covers. Take minimum mounting space.

Send for catalog. Proof of SQUAREMASTER efficiency stated in these 20 pages. Write today.

RIVETT furnishes a complete power package

AIR AND HYDRAULIC—VALVES, CYLINDERS, POWER UNITS

Member — National Fluid Power Association

UNDERWATER FLUID MOTOR

Concluded from page 86

veniently placed at the side of the operator's seat.

More power is available to the cutter head because the hydraulic motor, unlike other types of drive motors, is mounted at the lower end of the boom, right at the cutter head. This is possible because the motor can run under water. Other drive motors, which have to be out of the water, need long driveshafts to connect them to the cutter head. By getting rid of the long shaft and supporting bearings, the ladder can be much lighter. At the same time, cutter motor and gear reducer have enough weight for efficient digging.

• **Hydraulic System**—A triple-section hydraulic pump is driven at 1500 rpm by the diesel engine which also powers the centrifugal dredging pump, Figure 2. Driven at 1500 rpm, each pump section supplies 22.5 gpm at 1500 psi.

Fixed-displacement motor 1 drives the cutter head through a gear reducer. This motor's output is 14 hp at 1000 rpm and 1500 psi. Motor 2 rotates the winch which swings the cutter ladder from side to side. This motor develops 11 hp at 1000 rpm and 1500 psi. Motor 3 drives the winch which raises and lowers the ladder. It also develops 11 hp.

Control valves for motors 1 and 2 are 3-position, 4-way types with, integral relief valves. A check valve on the pressure side of each valve keeps the load from dropping due to pressurized return flow until enough pump pressure builds up to open the check valve.

Spud cylinders and motor 3 are controlled by a bank of three valves similar to those controlling the other two motors. These valves are open-center type and unload the pump when motor or cylinders are not working. The valves are parallel circuit and let both cylinders be operated at once, or at the same time as the motor. ▼▼▼

PRESSURE CYCLING CIRCUITS

Continued from page 82

intensifier (booster) produces the pressure. The intensifier is controlled by a solenoid, air valve which is actuated by a pressure switch in the hydraulic circuit. Intensifier speed is controlled by needle valves in the air lines.

Because of the intensifier's limited capacity, the system must be supplied with make-up fluid. This limited capacity also keeps the lowest pressure at 200 or 300 psi. If a lower minimum pressure is attempted, the displacement of the intensifier may not be sufficient to compress the air trapped in the fluid. Then it is not possible to reach the desired maximum pressure with the available intensifier

Concluded on next page

DESIGN ENGINEERS...

control small flows

with finger tip accuracy

on

Aircraft and Automotive Test Stands
Hydraulic Equipment
Pneumatic Equipment
Gas Analyzers
Metering and Proportioning Equipment
Pilot Plants
Test Instruments

280 SERIES METERING VALVES

Two orifice sizes of 1/16" and 1/8" are available with flow controlled by an 8-degree needle point taking 20 turns to move from open to closed position. In brass with O-ring stem seal or in 316 stainless with Teflon packing. For service to 3,000 psi, operating temperatures from −60° to 450°F. All valves have panel mounting lock nut.

Vernier Modifications

Hoke's #280-25 micrometer hand-wheel kit (illustrated) helps you establish a reference point as to the number of turns required for any flow rate. A low-cost, high-value accessory for precision control.

A SPECK OF DUST in metered fluid is all it takes to change the orifice setting in Hoke's highly-sensitive 280 Series valve. For critical metering requirements, it's always wise to use this 540 Series Micron Filter to keep foreign matter away from the valve. Complete information on request.

Why buy big when you can buy small

Hoke's Catalog MV-957 has all necessary information on 280 Series Valves and 540 Series Micron Filters. Yours for the asking.

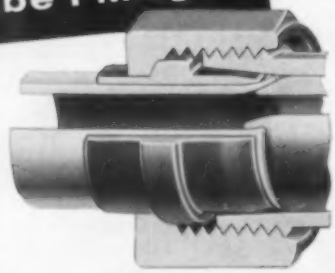
HOKE

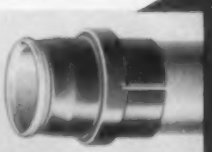
HOKE INCORPORATED
FLUID CONTROL SPECIALISTS
107 South Dean Street
Englewood, New Jersey

CIRCLE 57 ON READER SERVICE CARD

Reduce Installation and Replacement Costs ...Prevent Leakage with

FLODAR Self-Flaring Tube Fittings





- Eliminates flaring, threading and soldering.
- Cannot be damaged by over-tightening.
- "Rock-bottom" stop signals that joint is sealed.
- Provides positive, leak-proof seal.

One piece chrome-moly patented steel sleeve forces the tube end into the connector body automatically forming a pressure-tight seal on both the OD and ID of the tube. The slotted rear of the sleeve grips tube against vibration.

■ FLODAR self-flaring tube fittings eliminate time-consuming preparatory operations such as flaring, brazing, welding or soldering. Tubing costs are reduced because heavy wall tubing is not needed to assure a good joint. Even inexperienced assemblers can make a leak-tight joint every time.

Tube shearing and work hardening are eliminated . . . FLODAR Self-Flaring fittings can be reassembled time after time without fear of leakage and damage to tube and fitting.

The Complete Line of FLODAR Products

- No-Flare & Flare-Type Fittings
- High Pressure Pipe Fittings
- Straight Thread Tube Fittings
- Metal-to-Metal Porthole Fittings
- "O"-ring Type Porthole Fittings

Send for copy of complete hydraulic tube and pipe fittings

Stocks in All Principal Cities

FLODAR Corp.

16911 ST. CLAIR AVENUE • CLEVELAND 10, OHIO

PRESSURE CYCLING CIRCUITS

Concluded from preceding page

displacement. As much entrapped air as possible should be removed in any pressure test because this increases the energy which is released on failure of the test unit.

During normal operation, solenoid *A* is energized by a relay actuated by the pressure switch in the hydraulic system. When the *low* contacts make, the relay is actuated and locked in, energizing solenoid *A* and the thermal timer. When the *high* contacts make, the relay is short circuited and de-actuated. The resistor limits the current.

Because of leakage, the intensifier piston will eventually reach the bottom of its stroke, and this leakage must be replaced. For small systems where leakage is slight, a hand pump is sufficient for make up. In the system of Figure 2, an auxiliary, reciprocating, air-oil intensifier is used. If the main intensifier bottoms, the relay remains closed. After a timed period, the timer contacts close, actuating solenoid *B*. The secondary intensifier then supplies fluid to the system. This intensifier runs long enough to charge the main system, before the timer contacts open. ▼▼▼

MOTORIZED RELIEF VALVES

Concluded from page 80

expensive than the hydraulic rotary actuator arrangement. The two-speed control, permitting fast approach to the required pressure setting and slower speed for fine adjustment, is an important advantage. Also, the actuator has no drift.

• **Electronic Control**—Although hydraulic pressure is easily controlled, tensile stress in the part being stretched and formed around a die can vary considerably even though pressure on the tension cylinder remains constant. This is because of machine friction, the shape being formed or variations in the material.

A 25-ton radial draw former recently built for forming missile structural parts was equipped with the motorized relief valve incorporated into a tension control system. A strain gage load cell which measures tension was placed between the tension cylinder and the work. A potentiometer to measure elongation of the work was also added.

The information from these two sensing devices is fed into an electronic device which in turn controls the motorized valve actuator. The system determines yield electronically and maintains the tension at the yield point. During the work cycle, the pressure varies but the selected tension is maintained. ▼▼▼

BOSS . . . *PLEASE*

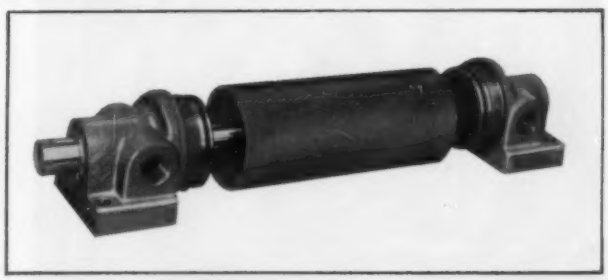
NEXT TIME BUY

PATHON CYLINDERS

Does your maintenance man need six arms? He won't if you specify

PATHON CYLINDERS

With* PATHON HYDRAULIC CYLINDERS *the maintenance you save may be your own.



Even the most durable equipment ultimately requires maintenance. When that time comes you continue to get extra advantages with Pathon Cylinders.

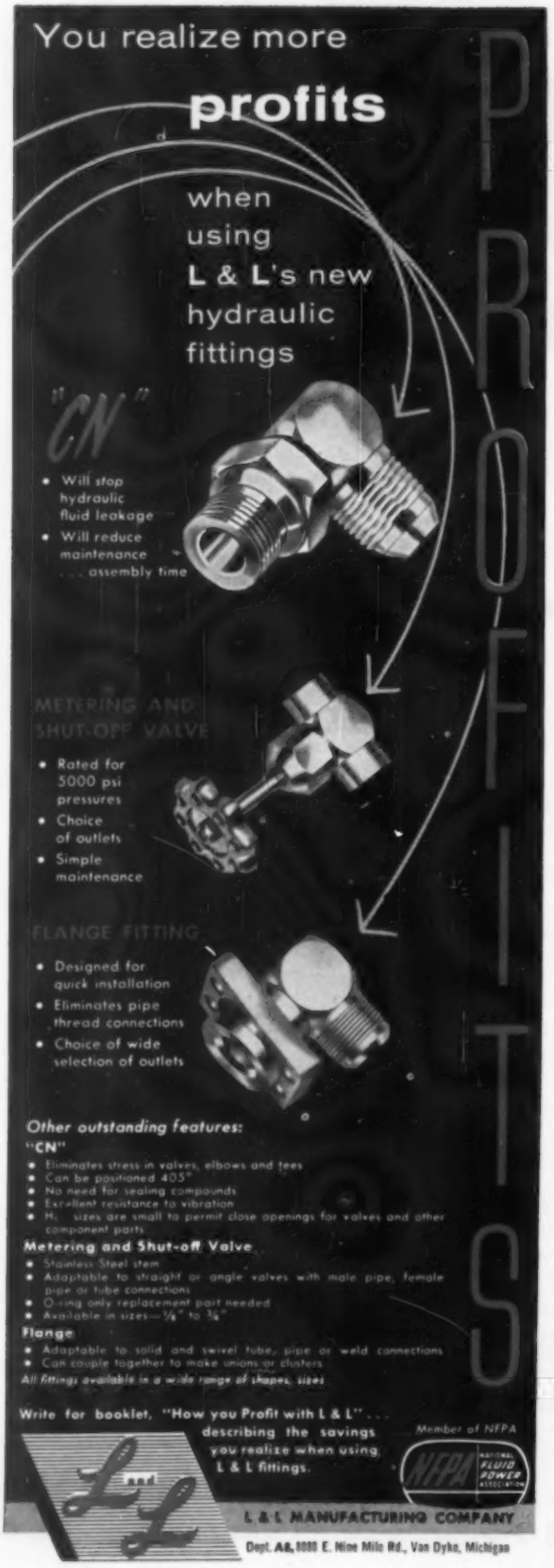
The rod packing is externally replaceable. When you disassemble the cylinder you do it so easily — *one piece at a time*. When you reassemble the piston in the barrel — no special tools, or collapsing devices are required.

With Pathon Cylinders you won't need a six armed maintenance man to reassemble an assortment of bolts, nuts, plates, mounting brackets, etc., and no more of this, "Joe, see if you can locate a torque wrench. We have to get this machine running."

Pathon

THE PATHON MANUFACTURING CO.
3823 Pacific Ave. Cincinnati 12, Ohio

CIRCLE 86 ON READER SERVICE CARD


You realize more
profits
when using L & L's new hydraulic fittings
PROFITS
"CN"
• Will stop hydraulic fluid leakage
• Will reduce maintenance . . . assembly time
METERING AND SHUT-OFF VALVE
• Rated for 5000 psi pressures
• Choice of outlets
• Simple maintenance
FLANGE FITTING
• Designed for quick installation
• Eliminates pipe thread connections
• Choice of wide selection of outlets
Other outstanding features:
"CN"
• Eliminates stress in valves, elbows and tees
• Can be positioned 405°
• No need for sealing compounds
• Excellent resistance to vibration
• H. sizes are small to permit close openings for valves and other component parts
Metering and Shut-off Valve
• Stainless Steel stem
• Adaptable to straight or angle valves with male pipe, female pipe or tube connections
• O-ring only replacement part needed
• Available in sizes—⅛" to ¾"
Flange
• Adaptable to solid and swivel tube, pipe or weld connections
• Can couple together to make unions or clusters
All fittings available in a wide range of shapes, sizes
Write for booklet, "How you Profit with L & L" . . . describing the savings you realize when using L & L fittings.
Member of NFPA
NFPA NATIONAL FLUID POWER ASSOCIATION
L and L
L & L MANUFACTURING COMPANY
Dept. A8, 1000 E. Nine Mile Rd., Van Dyke, Michigan

Fine positioning with

• By Harold Isaacs, *Vanguard*

Many mobile equipment manufacturers are faced with the problem of getting close speed control and fine positioning with their manually controlled hydraulic systems. Standard directional valves usually do not give the fine throttling that is needed. Although the valve handle can be carefully manipulated to give very fine control, few operators will develop this kind of touch.

ONE of the big selling points for Vanguard Engineering's Hydro-Boom is that you can put a load within 1/100 inch of where you want it. The mobile crane is used for precision handling of castings, forgings, jigs, dies, and heavy machine tool attachments. Back of its remarkable performance is years of experience in manufacturing valve spools for military aircraft. Vanguard put this know-how to work and modified standard valves to give an operator better "feel".

The mobile crane has cylinders for raising and extending the boom. A handwheel-operated screw rotates the boom about the center support. Fine positioning is required for the double acting cylinder which extends and retracts the boom.

• **Cammed Handle**—One method to obtain fine control is to use cams to increase valve handle travel relative to spool travel. This was Vanguard's first approach. The object was to get a variable ratio between valve handle travel and spool travel. At the beginning of valve actuation, a high ratio was needed for fine control. As the spool shifted, the ratio had to be rapidly reduced to limit the total handle travel to a reasonable amount.

As finally developed, the cam arrangement worked well but was bulky. Another difficulty with this design was the valve manufacturing tolerances which required special fitting of the cam and handle for each valve.

• **Port Insert**—The valves used at that time had a short stroke and no metering notches. Modification of the spool would have been difficult. The only metering incorporated in the valve was the opening of the round port as the valve land moved past.

Discarding the cam design, Vanguard went to a brass insert which modified the valve port. The insert, was pressed into the valve port with the

h modified valves

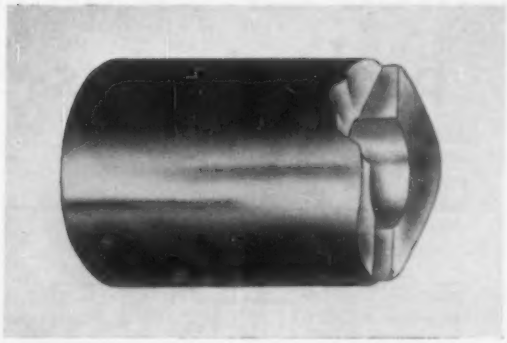
Engineering Co., Cleveland, Ohio

ONE OF THE FEATURES of this mobile crane which helped it take a first prize for design is its hydraulic control which permits a very slow movement of the load. Counterbalance valve holds cylinder when boom is tilted either up or down.

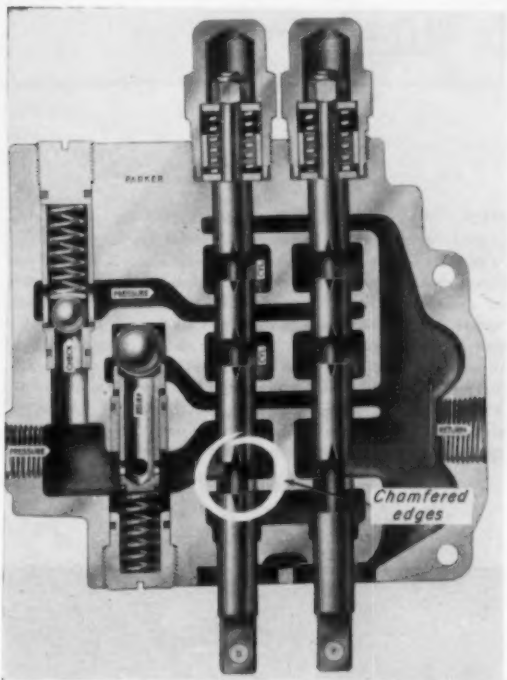
bottom, curved section projecting .002 to .005 inch into the spool bore. The valve bore was then hand reamed with a dull reamer to make the insert flush with the bore. This was done carefully to prevent damage to the honed, cross-hatch finish of the valve bore.

The insert then substituted its 1/16-inch slot for the original 3/8-inch port. As the spool land moved along the slot, throttling was very fine. When the land reached the inner 3/16-inch hole, throttling was coarser, but still finer than with the original large port. Because the slot was machined deeper at the inner hole than at the outer surface of the insert, the throttling orifice increased with flow to prevent any change in pressure drop. Flows as small as 20 cim could be gotten easily.

• **Chamfered Spool**—Although the insert was successful, still finer control was needed. Going to a different design of valve, it was decided to modify the spool to get the right characteristics. In the present arrangement, a slight chamfer is turned for a length of 3/16 inch on the spool lands which



FORMER DESIGN was a brass insert pressed into valve port. Tapered slot cut in insert metered flow as spool land moved across it.



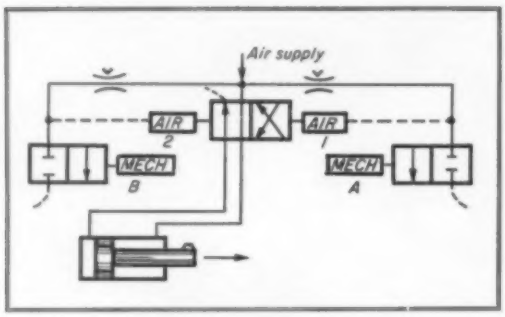
Courtesy Parker Hydraulics Div., Parker Hannifin Corp.

FINEST CONTROL is with present design in which spool land edges are slightly chamfered for a length of 1/8 inch. This slowly closes off bypass, tank connection as valve is shifted to direct fluid to the cylinder.

open and close the tank passage of the valve. This chamfer increases the total orifice formed by the throttling grooves and permits a slower closing of the tank connection of the tandem type valve, as the pump output is directed to the cylinder.

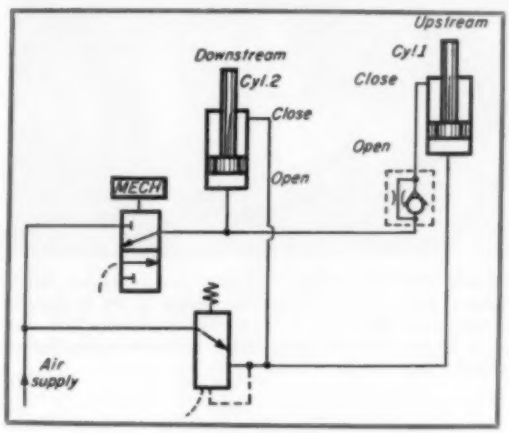
As the valve is shifted from its neutral position, less of the pump delivery is bypassed to tank, and consequently more is directed to the cylinder. Modifying these spool lands results in the finest metering, and flows of 3 to 4 cim can be readily obtained. Maximum flow through the valve is the full pump output of 3½ gpm. ▼▼▼

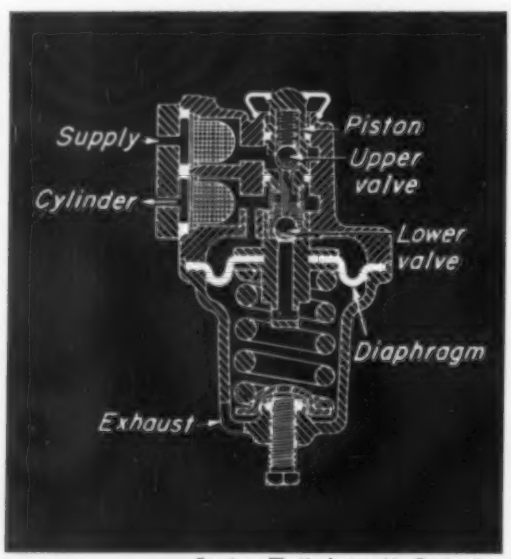
Three air circuits for packaging, assembling, measuring



AUTOMATIC CYCLING of a double-acting cylinder shakes flour during bagging. Piston rod on the out stroke trips mechanical limit valve A and permits air to escape from pilot 1 on the 4-way valve. Pressure in pilot chamber 2 shifts the valve spool retracting the piston. On the return stroke valve B is tripped reversing the piston. Frequency is changed by adjusting the variable flow control valves.

MEASURING LIQUID asphalt is done with two cylinders operating butterfly valves in a pipe line. With the 3-way valve in the position shown, air passes through the pressure reducing valve to the blank end of cylinder 1 and the rod end of cylinder 2. This opens the upstream butterfly valve and closes the one downstream. When the section of pipe is filled, the 3-way valve is shifted closing the upstream butterfly valve and opening the one downstream. The combination check and flow control valve assures that the downstream valve closes before the one upstream opens. This provides accurate measurement.

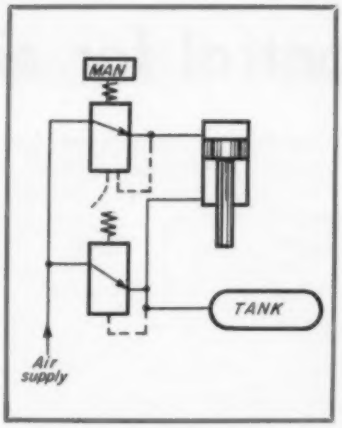




Courtesy Westinghouse Air Brake Co.

MOVEMENT OF THE PISTON is controlled by a foot pedal. Downward movement of piston closes the lower valve which shuts off air passage between the cylinder line and the exhaust to atmosphere. Further downward movement of the piston opens the upper valve, connecting the supply port to the cylinder line and the top of the diaphragm. When the force of air pressure on top of the diaphragm balances the spring force below the diaphragm, the upper valve closes and cuts off the air supply pressure. More downward movement of the piston increases pressure to the cylinder until it reaches the limit set by the adjusting spring.

As the piston moves up, the lower valve opens and cylinder pressure is vented to atmosphere until the adjusting spring force equals the force of the air pressure on top of the diaphragm. Further upward movement of the piston will vent additional cylinder pressure to atmosphere. Pressures can be increased or decreased in the cylinder line in small increments.



CIRCUIT DESIGNED **to "go easy on the pocketbook". In making pocketbooks it requires a light pressure to hold the metal frame while arranging material, and full pressure to clinch the frame. In this circuit pressure is varied to the top of the cylinder with a foot-operated pressure reducing valve (see illustration). A storage tank and an adjustable pressure reducing valve maintain low pressure air for raising the piston.** ▼▼▼

Recent Publications

Fluid Mechanics by Victor L. Streeter, Professor of Hydraulics, University of Michigan, 480 pp, price $7.50. Published by McGraw-Hill Book Co., New York.

The book is divided into two parts—part I, Fundamentals of Fluid Mechanics covers the development of equations and their use in simple applications. Part II, Applications of Fluid Mechanics, deals with more complex concepts of flow measurement, hydraulic machinery, pipe systems, open channel flow, and principles of control systems. The book has written to be used as a textbook for college hydraulics courses.

Proceedings of the National Conference on Industrial Hydraulics, Voluve XI, 290 pages, price $5.00. Book contains illustrations and text of the technical papers presented at the 13th annual meeting of the NCIH, Oct. 17, 18, 1957.

Volume contains 11 sections covering many papers presented on industrial and aircraft hydraulic components, systems, and fluids. One section is devoted to papers on high-pressure pneumatics. ▼▼▼

The valve that outlasts the equipment!

- ✳ New, unique plunger seal design
- Soft rubber seal assures bubble-tight sealing.
- Completely dependable for millions of cycles.
- Full operation in any position.
- Stainless steel internal construction, brass body.
- Easy to disassemble and clean.
- Smaller... Lighter.

Last longer than other valves... yet only $6.50 list.

ANOTHER VALCOR ENGINEERING EXCLUSIVE

VALCOR SV-4900 series...2.35" high by 1.50" wide...available 7/64 orifice rating 130 PSI max. and 5/32 rated 60 PSI max. ...for use with water, air, steam, inert gases, petroleum and vegetable oils, gasoline, kerosene and many other semi-corrosive media...and they are stocked for off-the-shelf delivery.

WRITE for VALCOR Catalog 105, plus information on the many VALCOR valves available.

VALCOR ENGINEERING CORP.
5368 CARNEGIE AVE.
KENILWORTH, N. J.

VALCOR
SOLENOID VALVES

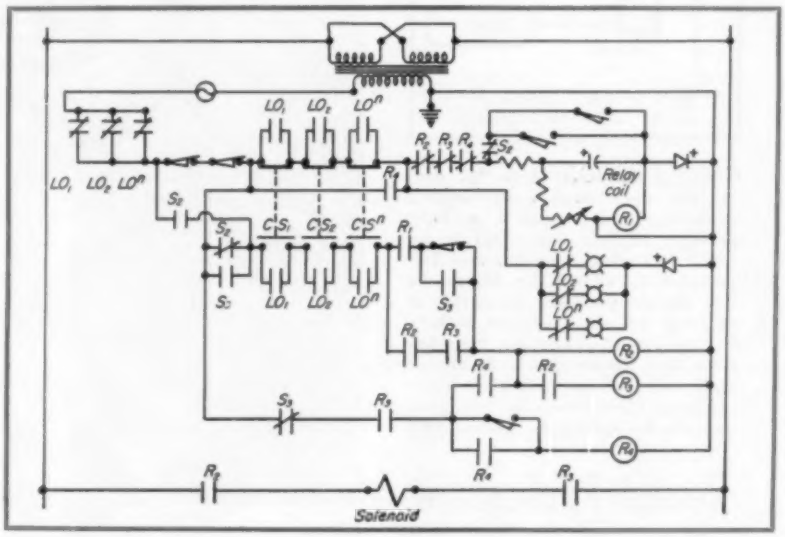
Fail-safe electric control for air-

HERE'S circuitry which guarantees safety to operator, equipment and work. The electric circuit design assures:

1. All operators must hold control switches
2. Switches must be held during entire downstroke
3. Cutter stops if any switch is released during downstroke
4. Machine stops at top of stroke
5. No repeat action is possible
6. Intentional cheating, short circuiting or broken connection will prevent operation.

Relay R1 in the control circuit is the key element for anti-cheat protection. The network of resistances and condenser around this relay act to hold the relay in its closed position for a short, predetermined time after the hand switches have been pressed. During this timed period all hand switches must be pressed to start the cutting stroke. If any switch had been tied down, the press will not start because the timing action could not be initiated.

● Air controls: A four-way solenoid valve controls a pneumatic clutch actuator on the shear. A double-acting air cylinder gives positive clutch operation. This electric and pneumatic circuitry can be applied to all types of presses. ▼▼▼



KOHLER
PRECISION CONTROLS

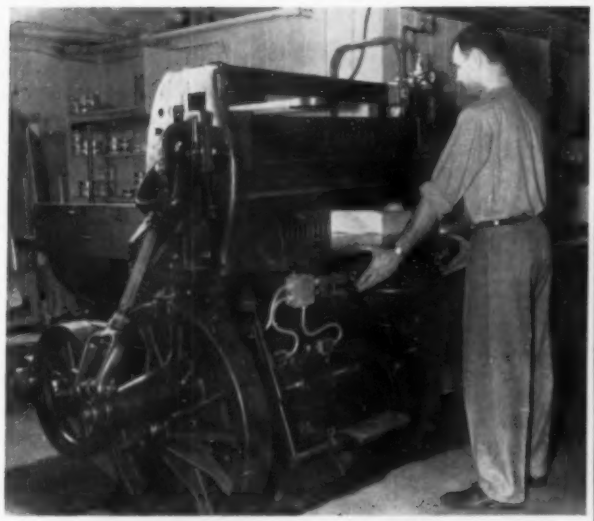
ENGINE PRIMERS used for
diesel engines, planes, tractors, trucks, buses

Kohler engine primers are used by leading manufacturers for many industrial applications, and by engine starting system fabricators. They operate efficiently with gasoline, diesel fuel or ethyl ether.

Usual causes of primer failure are eliminated by Kohler primers. They provide 100% displacement with each stroke, with steady, even flow. Ball checks in the body open and close alternately with each piston stroke. Ground seat and machined seating pin on piston tip prevent fuel seepage when primer is not in use.

KOHLER CO. Established 1873 KOHLER, WIS.
KOHLER OF KOHLER
Enameled Iron and Vitreous China Plumbing Fixtures • Brass Fittings
Electric Plants • Air-cooled Engines • Precision Controls

powered cutter



SHEAR can only operate when the operator's hands are out of the danger area.

CIRCUIT offers more than just "two-hand" control. Interlocks prevent operation if any start button is tied down, and prevent repeat action.

Courtesy Micro-Switch, Div. of Minneapolis-Honeywell Regulator Co.

Inside your plant...

Resists oil, abrasion

Prolongs life of tools, permits oiling by oil liner. Of vinyl plastic without braid. Strongly resists abrasion.

Delivers more air

Smooth interior surface allows more air delivery than any other hose of comparable size. Close I.D. and O.D. tolerances permit same flow from any run.

Light, flexible

Your worker lifts less, tires less, does more. Foster plastic air hose weighs less than hose of other material.

AND LOW COST, TOO!

New free catalog. Write today

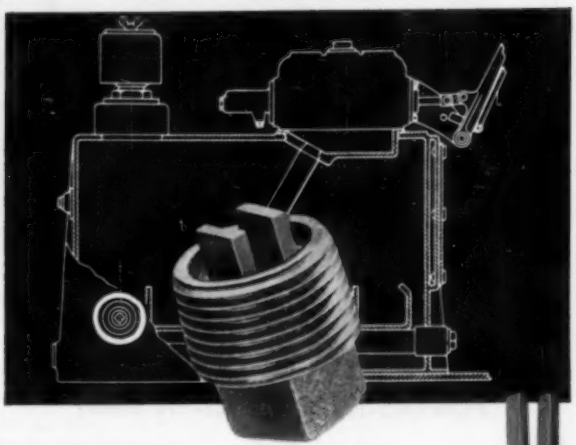
FOSTER MFG. CO., INC.

2850 Gravois, Dept. 13-C, St. Louis 18, Mo.

CIRCLE 41 ON READER SERVICE CARD

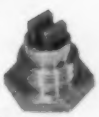
Prevent

CLOGGING or FOULING of VALVES and PUMPS



LISLE *Magnetic* PLUGS

Insure That Hydraulic Systems Will Work At Their Best



Controlled tests have proved that Lisle Magnetic Plugs installed in the flow path pick up abrasive ferrous particles and prevent them from interfering with the proper function of hydraulic systems. They guarantee longer life (up to 3 times) for pumps and other moving parts.

MANY TYPES AND STYLES TO CHOOSE FROM . . .

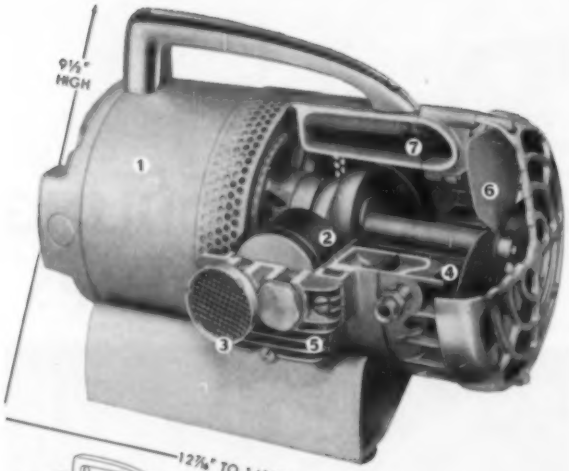
Lisle Corporation offers complete facilities for designing and manufacturing magnetic plugs for special installations.

Write for your free catalog and a sample Lisle magnetic plug for testing. Please state thread size.

LISLE *Corporation*

CLARINDA, IOWA

CIRCLE 74 ON READER SERVICE CARD



Oil-Free

COMPRESSED AIR

CLEAN, COOL, DRY... FROM THIS PORTABLE OR BUILT-IN UNIT

Here is a compressor which doesn't need lubrication of any kind—eliminates an oil separator—*ends expensive lubrication maintenance.* Where else can you find all these features—

Easily carried portable model.

1 **Special motors.** Built by B&G—ball bearings *permanently* grease packed.

2 **Graphite piston rings and skirts.** Never need lubrication—operate for years without destroying mirror-finish of cylinder walls.

3 **Dry valve construction.** Inlet and exhaust valves are positive sealing without presence of oil.

4 **Safety valve.** (Not visible.) Provides constant bleed-off at maximum pressure.

"Duplex Unit," mounted on horizontal tank.

5 **Bi-metal cylinder head.** Transfers heat faster—shrink-fitted around cast iron cylinder.

6 **Blast cooled.** Low temperature operation assures higher efficiency, longer life.

7 **Combined aftercooler, pulsation chamber, moisture separator.** Assures cooler, drier air at uniform pressure.

B&G Compressor built into dry cleaning machine.

B&G Oil-less Compressors are available in a complete line of portable tank-mounted and tankless models. Send for catalog GO-1156.

Oil-less

AIR COMPRESSORS

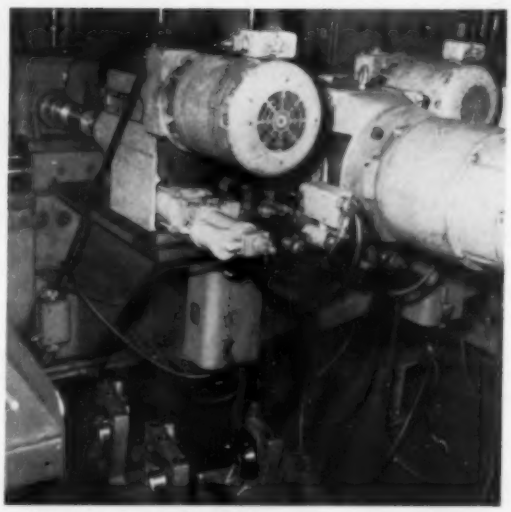
BELL & GOSSETT COMPANY

Dept. FH-66, Morton Grove, Illinois

Air cuts costs on

● By R. S. Brosius,

President and General Manager, Bethandale Corp., Cleveland, Ohio.



HYDRAULIC CHECKING device gives accurate feed rate to air cylinders by regulating oil flow through needle valve in check cylinder.

AT ONE STATION the housing turns 90 deg in order to drill at an angle. The air cylinder which operates the turntable does not have a hydraulic check since speed is not critical. A variable restriction in the exhaust line gives enough speed control.

tool feed circuits

A production machine shop tackled the job of designing and building an air-operated in-line transfer machine for machining power steering pump housings.

BUILDING your own transfer machine is no small job, but when the budget won't permit the purchase of one, there's no choice. Air pressure and ingenuity helped provide the solution.

• **Circuits Considered**—The first thought was to use a conventional all-hydraulic circuit, however after a cost survey, we decided to look into other methods. By using air cylinders with hydraulic dash-pots it was found a machine could be built for about 1/3 the cost of an all-hydraulic unit.

• **Design**—Machine is fully automatic except for loading. It has 9 stations and 18 machining heads performing 30 separate machining operations.

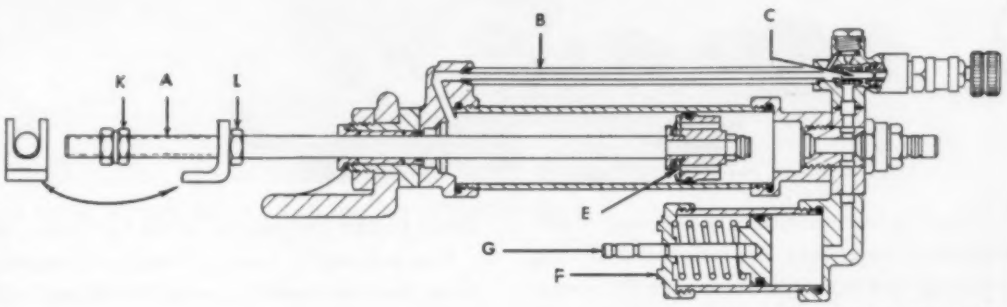
Included in these operations are drilling, tapping, reaming, boring, and milling. Twelve of the machining heads are operated by air cylinders having a hydraulic check to control feed. The remaining heads are cam operated.

Tool thrusts required at the air operated stations were varied by selecting the proper air cylinder bore for the force required. Rapid tool advance is accomplished by adjusting stop nuts on the checking device, allowing it to operate only during machining operation. Tool feeds can be adjusted through a range to cover any type of machining operation.

Sequencing is extremely accurate requiring 26 sec to complete all machining operations.

• **Electrical**—Limit switches on machining heads connected in series, prevent indexing until all tools are retracted. Costs were reduced by using one limit switch to indicate when all clamping cylinders are in place. A restriction in the exhaust from the clamp cylinder which trips the limit switch causes it to operate last. All cylinders are controlled by 4-way solenoid valves energized and de-energized by limit switches. ▼▼▼

How the Hydraulic Check Works



Courtesy The Bellows Co., Akron, Ohio

The unit consists of an oil-filled cylinder, piston rod, adjustable needle valve, and a balance cylinder.

The piston rod A is connected to the rod on the air cylinder to be checked. As rod A is pulled out, the moving piston forces oil in the checking cylinder through transfer tube B and through the needle valve C into the rear of checking cylinder. The rate of flow is determined by the setting of needle valve C.

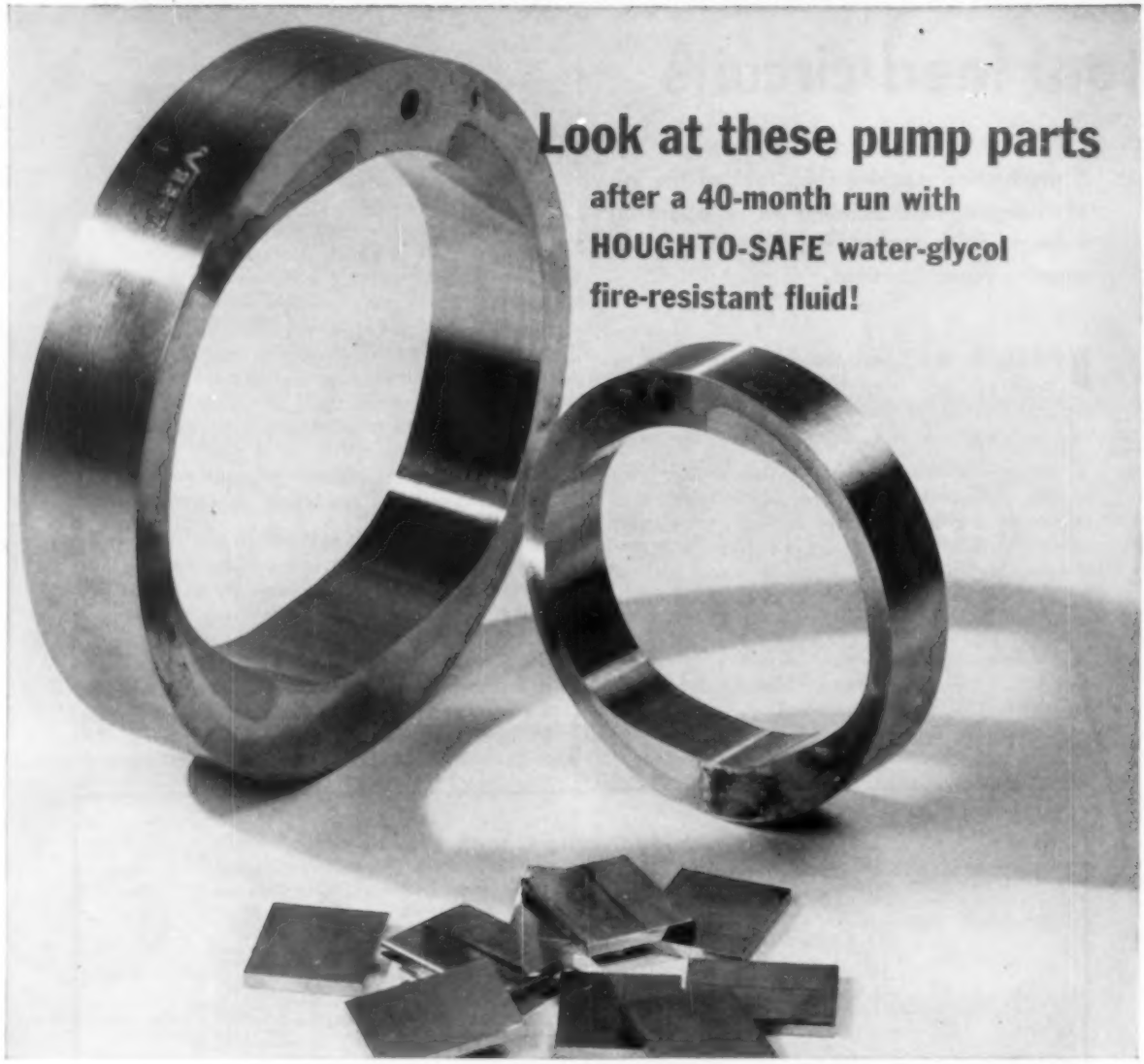
On the return stroke, one-way valve E permits oil to flow freely through the piston.

The spring-loaded balance cylinder F acts as a reservoir for the oil displaced by the piston rod A on the inward stroke, and returns this oil to the main cylinder on the return stroke.

Indicator rod G, attached to balance cylinder piston, shows when oil should be added.

Adjustable Rapid Traverse—Check is mounted to the frame of the cylinder to be controlled. An actuating bracket, drilled or slotted to clear the check piston rod is mounted on the rod of the cylinder to be checked. Bracket advancing from rod nut L will move freely until it contacts rod nut K at which time checking begins and will continue until forward movement ends.

No checking occurs on the return stroke. Retracting actuating bracket engages nut L returning the piston rod to fully retracted position.



Look at these pump parts

after a 40-month run with HOUGHTO-SAFE water-glycol fire-resistant fluid!

HERE'S PROOF of the lubricating ability of Houghto-Safe 620, Houghton's water-base fire-resistant hydraulic fluid. These rings and vanes, removed from the pump, show only negligible wear after more than 3 years of service.

The Houghto-Safe fluid was operating in the combination hydraulic pump of a production die casting machine. Mineral oil previously used was replaced by the Houghto-Safe to eliminate danger of fires and to cut downtime involved in regular oil changes.

Length of service for the fluid was 40 months. Maintenance was limited only to regular water make-up—about 1 quart per month—in the 160 gallon reservoir.

You see, above, what maintenance engineers found when they tore down the pump. The Houghto-Safe was in its original condition after 40 months of service and the appearance of the parts proves that Houghto-Safe 620 can be used even in applications where lubricity and corrosion protection are critical.

Write for our folder on Houghto-Safe 620 Fire-Resistant Hydraulic Fluid. The address: E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Pa.

HOUGHTO-SAFE 620 . . . *a product of*

E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

Applied Hydraulics JUNE 1958

AVIATION SECTION

MANIFOLDED BOOSTERS IMPROVE RELIABILITY 102
By C. H. Cannon

Analysis of common causes of flight control booster failures suggested the cures. Manifolding prevents leaks, gets rid of improper installation of many components and eliminates hoses or swivel joints.

TESTING ELECTROHYDRAULIC SERVO VALVES 106
By Kenneth S. Knapton, Jr.

Testing servo valves can be a tedious job and two different people can disagree on test results with commonly-used methods. A special test machine speeds testing and assures identical results even at separate locations.

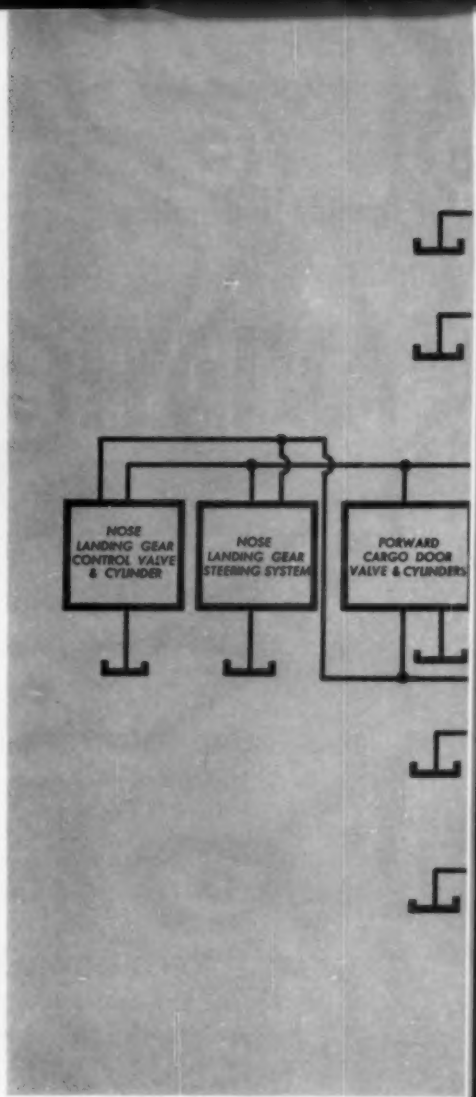
AVIATION NEWS FROM THE FLUID POWER FIELD 113

AVIATION COMPONENT DATA 114

EDITORIAL ADVISORY BOARD

WAYNE S. BOALS Pantex Mfg. Corp. • **HAROLD E. WELLS** Bendix Aviation Corp. • **H. G. CONWAY** Short Bros & Harland, Ltd. • **RALPH E. MIDDLETON** Lockheed Aircraft Corp. • **HOWARD FIELD, JR.** Convair, A Division of General Dynamics Corp. • **W. F. TALBOT** Northrop Aircraft, Inc. • **ALBERT WEISSKOPF** Grumman Aircraft Engineering Corp. • **KENNETH W. DUBOIS** Douglas Aircraft Co.

TURBOPROP-POWERED LOCKHEED C-130A Hercules is a real flying freighter. In its cargo compartment that is bigger than the inside of a boxcar, 22-ton loads can be carried 1750 miles nonstop; 16-ton loads can be carried 3000 miles. Normal cruising speed is about 350 mph. Hydraulic power boosting of the 108,000-lb plane's flight controls and hydraulic power steering on the ground make her easy to handle in spite of her size.



Manifolded boosters improve hydraulic system dependability

• By C. H. Cannon, *Manager*
Mechanical Systems Engineering Lockheed Aircraft Corp., Georgia Div., Marietta, Ga.

ALTHOUGH it's bigger than a boxcar, inside, and weighs 108,000 pounds, our C-130A Hercules cargo plane is easily controlled both in the air and on the ground because it has hydraulic power boosters for the flight controls and hydraulic nose wheel steering. This aerial truck can even be backed up to a loading dock by using the fully reversible pitch propellors on the Allison turboprop engines. Ground handling of freight is also simplified by hydraulics. Cargo door and an integral ramp are hydraulically operated. They let lift trucks or other vehicles be driven right into the hold.

Hydraulics also does many other jobs. Hydraulics retracts the gear, works the flaps and brakes the wheels. Figure 1 shows the complete hydraulic system.

• **Hydraulic Circuitry**—Our years of experience with aircraft hydraulics, from the P-38 to the Constellations, set the basic hydraulic design and circuitry. But, experience also taught us how to make the system even more dependable.

Our first step toward total dependability was to use three separate pumping systems to supply fluid pressure. The main source is two 8-gpm pumps driven by engines 2 and 4. Oil from these pumps usually goes to all systems except the cargo doors and ramp, see Figure 1. But, in an emergency, selector valves let pressure from these pumps be used to work them too. Two more 8-gpm pumps driven by engines 1 and 3 are the booster system source. They supply oil to only one section of the tandem booster system. The auxiliary system power supply is one 8-gpm pump, driven by an air turbine, which is driven by a compressor carried on the airplane.

Auxiliary system pressure usually is used only to operate cargo doors and ramp, but in a pinch this pump can be connected to operate landing gear, wing flaps, and brakes. Additional measures to prevent loss of hydraulic power are accumulators in the main and booster systems, and hand pumps in the main and auxiliary systems.

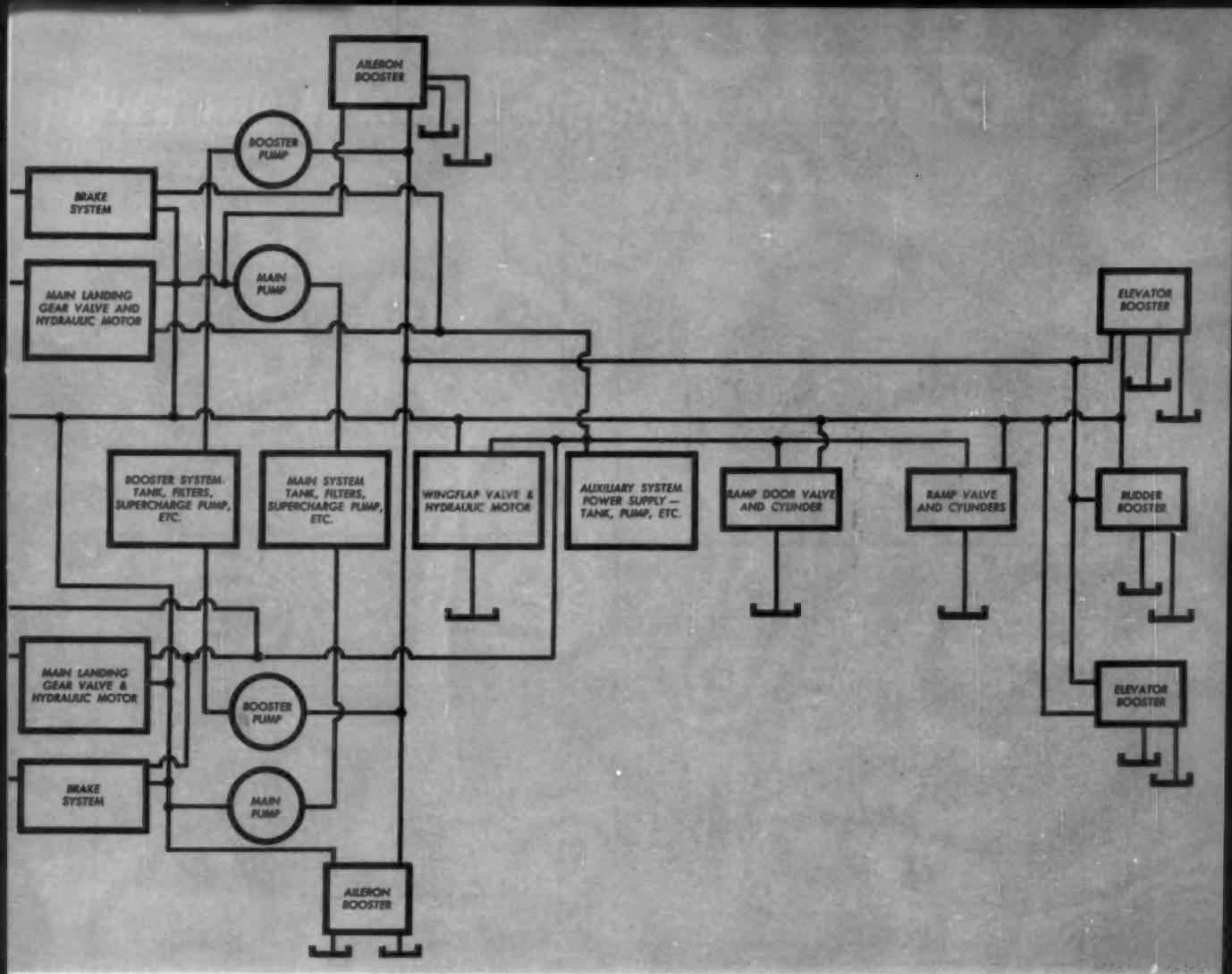


FIG. 1. BLOCK DIAGRAM of Hercules hydraulic system shows how three independent systems are interconnected to assure dependable operation.

• **System Details**—Operating temperature range is—65 to 160F. MIL-0-5606 oil is used. Engine driven pumps rotate at 3690 rpm and operating pressure is 3000 psi.

Because suction lines from tanks to the pumps driven by the outboard engines are about 120-ft long, electric motor-driven supercharge pumps are used. They supply oil to the main pump inlets at 100 psi.

Standard AN flared fittings are used with the stainless steel pressure lines and aluminum return lines. Standard O-ring seals are used with single-turn Teflon backup rings. We tried spiral Teflon backups, but many leaked because it was too hard to install them right.

• **Power Booster Design**—From experience, we knew that power boost systems usually fail because: fittings leak, valves are jammed by chips, valve spools bind from expansion or deflection of the valve body, hoses and seals fail, fittings and other parts are not correctly assembled or adjusted, and parts corrode. The power boost system is so important to safe control in flight that we designed it to get rid of as many of these failure-causers as we could.

First, many leak sources were done away with by manifolding the complete boost unit consisting of filters, strainers, bypass valves, anticavitation valves, servo valves

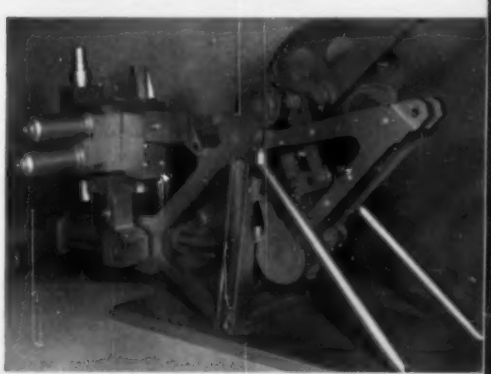


FIG. 2. RUDDER BOOSTER ASSEMBLY for the Hercules mounted on the operating linkage. Manifolded valves, filters, etc. eliminate many possible leakage points. Trunnion fed cylinder eliminates hoses, coiled tubing or swivel fittings.

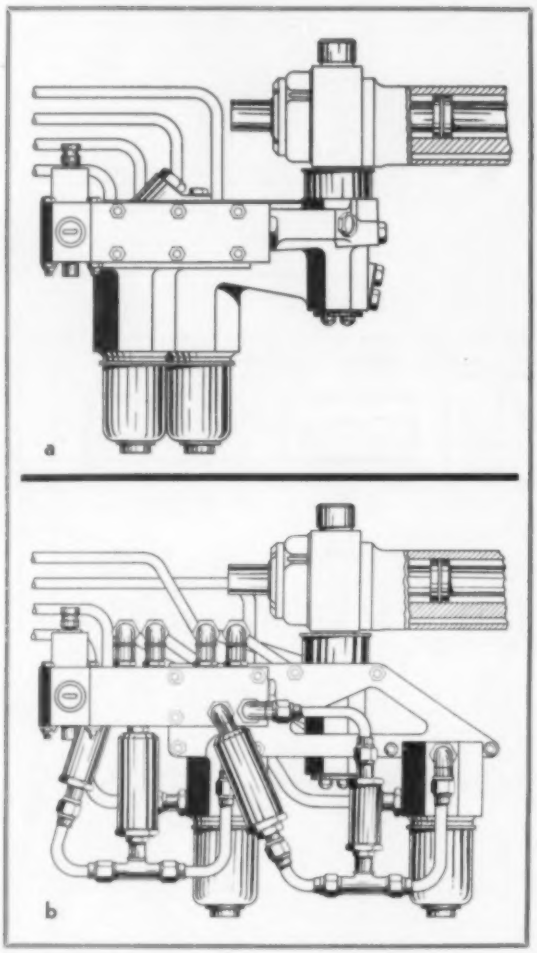


FIG. 3. SKETCHES OF MANIFOLDED, *a*, and plumbed booster assemblies, *b*. Many tubing lines and fittings are eliminated by manifolding.

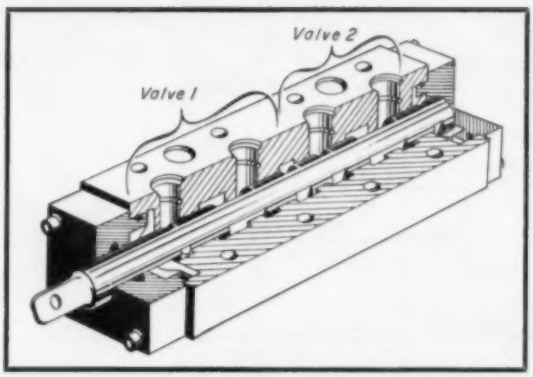


FIG. 4. TANDEM SERVO VALVE is two hydraulically independent valves in one physical unit. Synchronization of spool movement is assured.

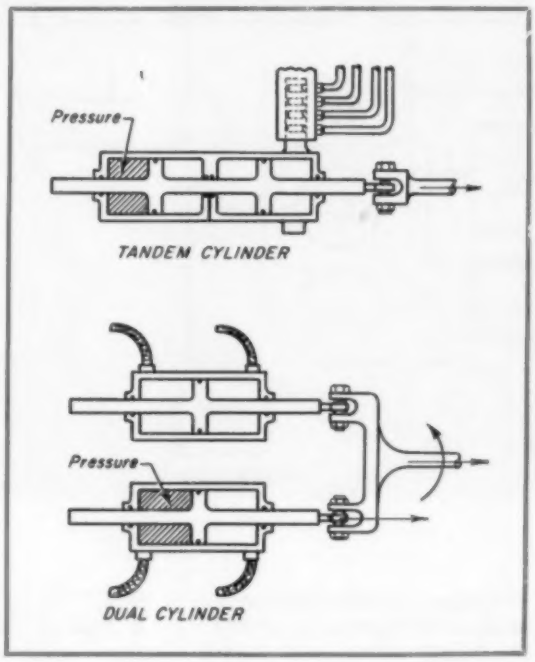


FIG. 5. TANDEM ACTUATOR CYLINDER makes synchronization positive, simplifies linkage, and eliminates any chance of off-center force being applied to linkage.

and power cylinder. The cylinder is fed through the trunnion mounting to eliminate hoses, coiled tubing or swivel fittings. Figure 2 shows such a unit. Figure 3 compares it with a conventionally plumbed assembly.

Wire mesh strainers with 0.008-in. opening and 10 micron filters in the manifold keep dirt, metal chips, etc. out of the servo valves. The strainers come after the filters because we discovered that metal chips can get through the filters in spite of the 10 micron rating.

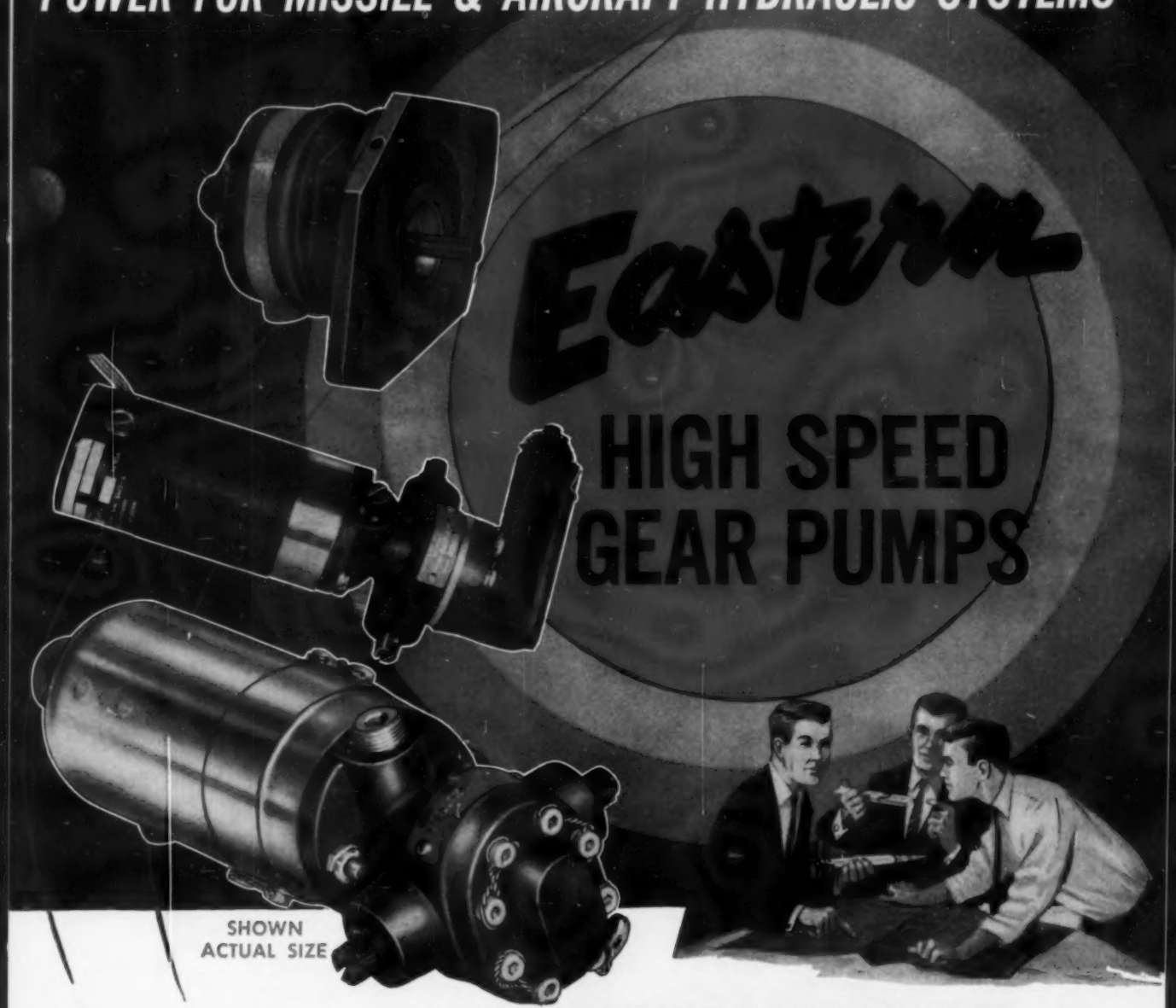
• **Servo Valve Design**—Corrosion-resistant steel is used in the servo valves to eliminate corrosion failures. Metering holes in the valve sleeves and sharp shearing edges on the spools make the servo valves nonjamming. Anything that gets into the valve, including metal chips, will be sheared instead of jamming the valves.

Positive synchronization of the dual servo valves comes from making the two valves as a single unit. A single valve body and a single spool is two hydraulically independent units, Figure 4. Physically in one piece, the two valves must always work in perfect unison.

• **Actuator Design**—The dual actuator cylinders in the flight control boost system are synchronized by using tandem cylinders, Figure 5*a*, instead of two single cylinders, Figure 5*b*. This also simplifies the linkage to the control surface and eliminates the chances of bending or binding the linkage if one system should fail. ▼▼▼

CIRCLE 35 ⟶

POWER FOR MISSILE & AIRCRAFT HYDRAULIC SYSTEMS



Eastern Aviation Hydraulic Pumps set new standards for performance, yet are the smallest, most lightweight ever made.

By meeting customer requirements and government specifications with precise detail, Eastern Pumps give reliable long-term service.

Hundreds of models, close-coupled to electric motors with speeds to 24,000 RPM, can be furnished for your special systems. You gain the advantage of economical mass-produced components custom-engineered into whatever configuration is needed. Performance is from .015 to 1.5 GPM, 0 to 3000 PSIG, with theoretical displacements from .0021 to .0419 cubic inches per revolution. A variety of bearing combinations handle different types of fluid and operating pressures.

Missile and aircraft system engineers have discovered Eastern Pumps do the same job as units that use greater space and weigh far more. Applications have included circulating coolant in bomber guidance system, providing hydraulic power for ground control of jet, charging accumulator in an in-flight refueling system, furnishing an APU system with power to a missile, and countless others.

For your next project, contact Eastern for creative engineering help that really helps.

Write for NEW Aviation Bulletin 350 describing the above units and larger-capacity pumps.

Eastern AVIATION PRODUCTS

EASTERN INDUSTRIES, INCORPORATED

100 Skiff Street • Hamden 14, Conn. **West Coast Office: 1608 Centinela Avenue • Inglewood 3, California**

Testing precision aircraft servo valves can be a tedious, time-consuming process by usual methods. Human error in making test connections as well as interpretation of test readings may cause rejection of good valves and vice versa. Here's a semi-automatic machine developed for this job. Human error is virtually eliminated and test time is reduced from hours to minutes.

Testing electro-hydraulic servo valves

• By Kenneth S. Knapton, Jr., *Product Manager-Hydraulics, Sanders Associates Inc., Nashua, N. H.*

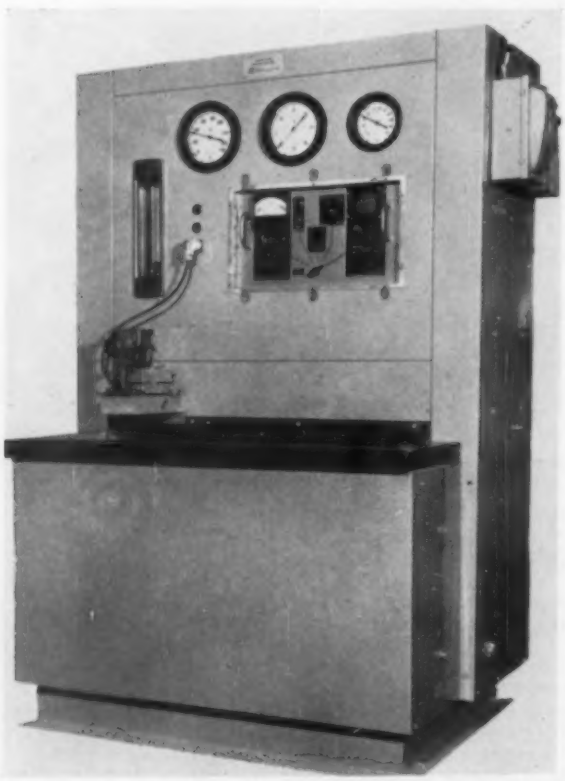


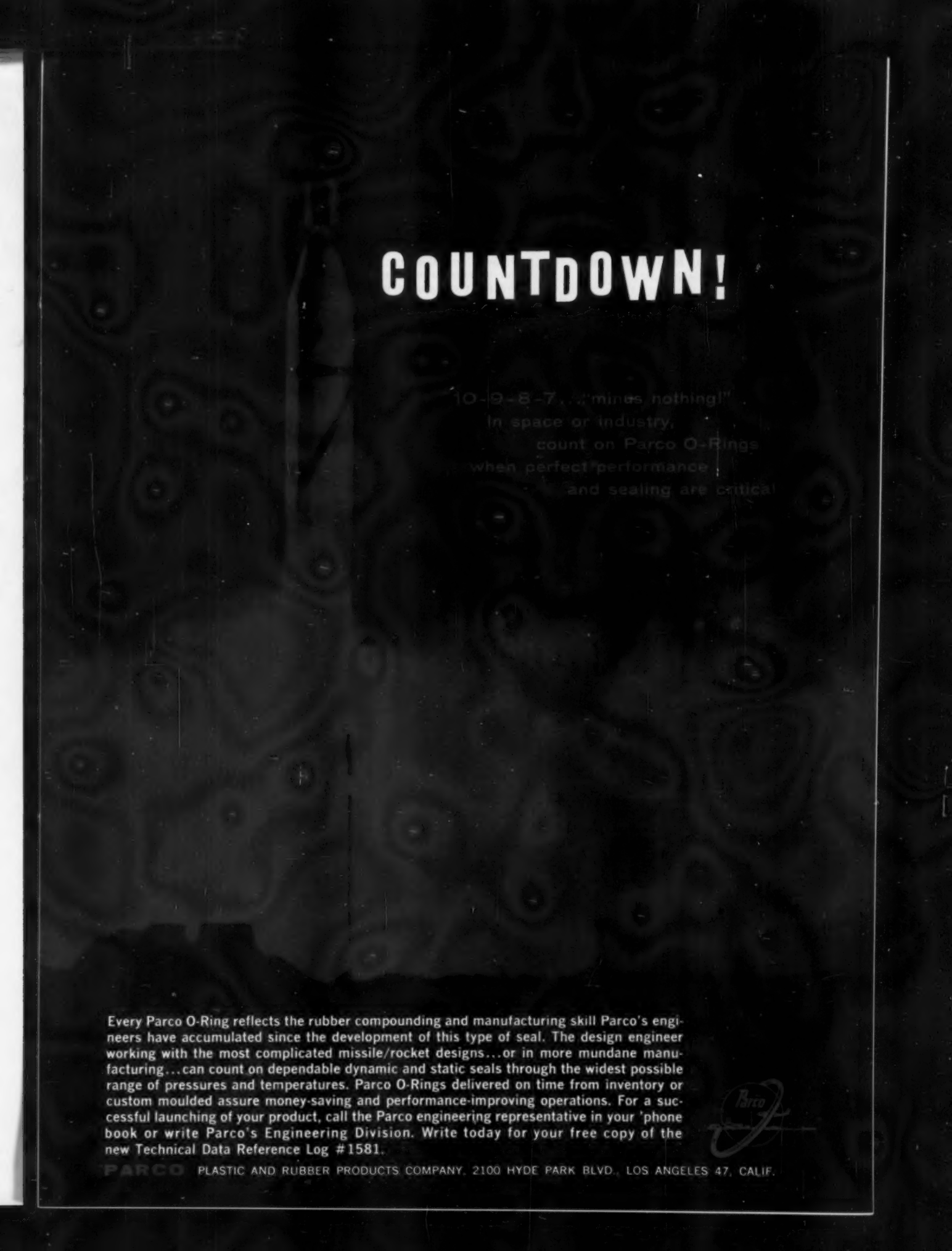
FIG. 1. PRODUCTION TEST STAND completely tests a servo valve in 8 min. Pass and not-pass indication eliminates operator opinion.

USUALLY, testing a precision electro-hydraulic servo valve requires a highly trained technician equipped with a variety of equipment including a hydraulic test stand, flow meters, oscilloscopes, oscillators, amplifiers, high potential testers, ohmmeters, inductance meters, phase-shift meters, etc. Actual test under such conditions could take from 2 to 4 hr, depending on the technician's skill. Errors can, of course, be made in connecting up the equipment due to its complexity. To further complicate matters, customer acceptance tests might depart from manufacturer's tests in some fashion, or judgement of the customer's inspector might cause rejection of valves that were acceptable in the opinion of the manufacturer's inspector.

Obviously, testing machines which would reduce the time involved, eliminate operator judgement and error, require only an unskilled operator, and give identical results in plants of both manufacturer and customer are extremely desirable. Such a machine, Figure 1, has been developed by Sanders and an identical machine also built for use in incoming inspection at their customer's plant. Only 30 minutes instruction is necessary to permit a relatively unskilled person to accurately and precisely test a servo valve in less than 8 min. A typical lab setup is shown in Figure 2 for comparison.

• **Tests Performed**—Valve to be tested on the machine is a four-way, closed-center type

CIRCLE 89


COUNTDOWN!
10-9-8-7. . .*mines nothing!"
In space or industry,
count on Parco O-Rings
when perfect performance
and sealing are critical
Every Parco O-Ring reflects the rubber compounding and manufacturing skill Parco's engineers have accumulated since the development of this type of seal. The design engineer working with the most complicated missile/rocket designs...or in more mundane manufacturing...can count on dependable dynamic and static seals through the widest possible range of pressures and temperatures. Parco O-Rings delivered on time from inventory or custom moulded assure money-saving and performance-improving operations. For a successful launching of your product, call the Parco engineering representative in your 'phone book or write Parco's Engineering Division. Write today for your free copy of the new Technical Data Reference Log #1581.
Parco
PARCO PLASTIC AND RUBBER PRODUCTS COMPANY, 2100 HYDE PARK BLVD., LOS ANGELES 47, CALIF.

with rated maximum flow of 3 gpm at 350 psi. Spool position is controlled by an electrical force motor requiring differential current of ±20 ma for full flow rate. Tests performed include:

1. Complete electrical characteristics of the force motor which includes the sum of the resistances of both coils, difference in the resistance of the coils, inductance of each coil and mutual inductance between the two coils. A high-voltage test from the coils to ground is also performed.
2. Proof pressure test of the valve at 3 times normal operating pressure for two 1-min periods.
3. Flow linearity tests of output flow vs. input current to determine flow gain as well as linearity.
4. Null error test to indicate maximum internal leakage.
5. Phase shift tests to indicate phase shift between output flow and input current.
6. Dynamic resolution test to indicate minmium input signal which will produce a change in output flow.

Test stand shown in Figure 1 performs these operations. All indicators and controls except the flowmeter and hydraulic pressure gages are on a panel measuring approximately 10 by 18 in., Figure 3.

• **Test Procedure**—First step in actual testing is mounting and connecting the valve. This is done by first turning a selector lever on the panel, Figure 3, to the *Valve Change* position. This assures that hydraulic fluid and electrical current are shut off. A mounting plate with ports to match those in the valve, a special clamp for holding the valve, and an electrical connecting cord make mounting and connection quick and easy. A positioning pin assures that ports in the mounting plate and the valve will be accurately aligned. An interlocking switch on the valve clamping mechanism keeps all power turned off if there is no valve in position or if the clamp is not tight. This switch also shuts the tester down if anyone tries to remove the valve without first selecting *Valve Change*.

With the valve mounted and connected, selector is turned to

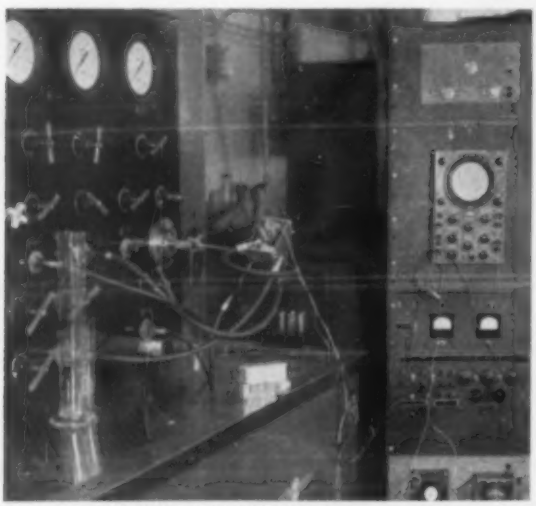


FIG. 2. LABORATORY SETUP for servo valve testing can be complicated, cumbersome, and time consuming. Many possibilities for error and differences of opinion exist.

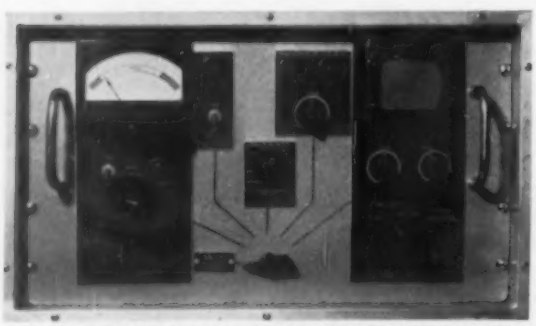


FIG. 3. PRACTICALLY ALL INDICATORS AND CONTROLS for the servo valve tester are mounted on this panel which measures approximately 10 by 18 in.

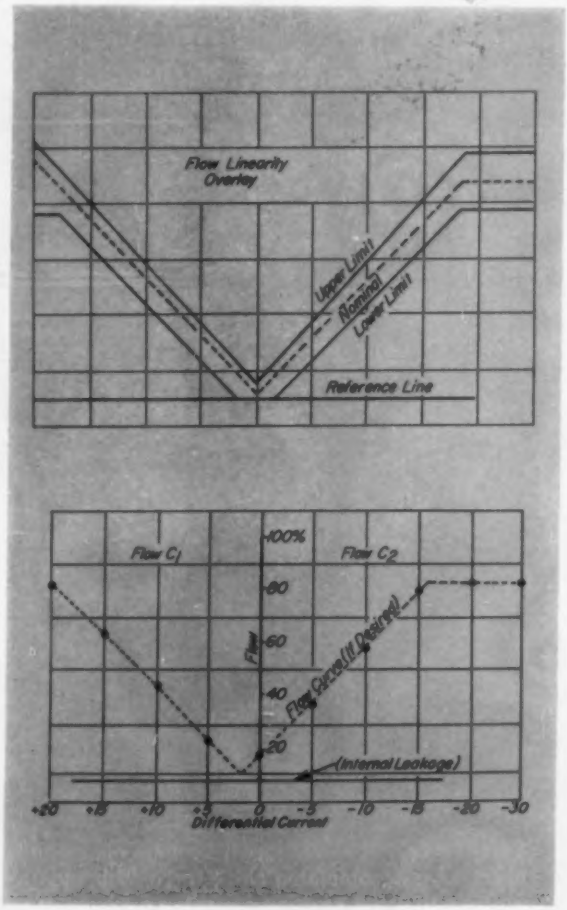


FIG. 4. TYPICAL LINEARITY PLOT and master overlay used for checking servo valve flow against force motor current.

600 DEGREES FOR 6 MINUTES!

Left to right: **1** Containers (5,000 psi), **2** Relief Valve, **3** Check Valve, **4** Priority Valve, **5** Pressure Reducers, **6** Filter, **7** Solenoid Valves.

Six minutes at 600 degrees F. . . . or for shorter periods up to *1000* degrees! That's the life expectancy of these and more than 100 other qualified pneumatic system components which Kidde has on an off-the-shelf basis. If you are developing pneumatic equipment for missiles or manned aircraft which involve high or low temperature applications, write Kidde today.

Kidde's available, *proven* pneumatic components plus Kidde's years of experience with pneumatic systems can save you many hours – *and* dollars in development effort!

Walter Kidde & Company, Inc., Aviation Division
616 Main Street, Belleville 9, N. J.

Kidde

District Sales Engineering Offices:
Dallas, Tex.—Dayton, Ohio—St. Louis, Mo.
Seattle Wash.—Van Nuys, Calif.—Washington, D. C.

Walter Kidde-Pacific, Van Nuys, California
Walter Kidde & Company of Canada Ltd.
Montreal—Toronto—Vancouver

Visit Kidde's Booth #51, A. R. S. Exposition, June 9-11, Statler Hotel, Los Angeles

CIRCLE 69 ON READER SERVICE CARD

Coil Test. A subsidiary selector is then used to select the high potential test, resistance, and inductance tests. In each case a panel meter indicates either that the valve passes or it does not. No actual values are shown.

At the completion of the coil tests, the main selector is turned to the *Proof Pressure* position. Turning a toggle switch to the *on* position then automatically applies 1200-psi hydraulic pressure to the valve. At the end of a 1-min period, a buzzer sounds. The operator then returns the toggle switch to the *off* position and waits until pressure on a gage above the panel drops to 50 psi. Switch is then turned on to reapply pressure for an additional 1-min period. During this test, the operator watches the valves for leaks or deformation.

Linearity test is next. The main selector is turned to the *Linearity Test* position and a subsidiary selector is used to select various current flows from −30 to +20 ma. At each position, the operator reads a flow meter calibrated in per cent full flow and plots these points on a chart provided for this purpose. This operation could have been automated. However, cost of an X-Y plotter was not justified by the small time saving.

Null error test is now performed by turning the main selector to this position. The selector then points to a portion of the main panel on which two amber indicator lights and a knob labelled *Null Error* are mounted. Rotation of the knob varies current applied to the valve force motor. Lights indicate position of an actuator being controlled by the valve. If the valve passes this portion of the test, the knob is rotated to the point where one light goes off and the other on. A flow meter reading is then taken and recorded. This value is the leakage flow.

Dynamic response tests consist of tests for high-level phase shift, low-level phase shift and dynamic resolution. For each of these a knob is turned to obtain a specific pattern on the oscilloscope mounted on the panel. If the valve passes, the knob will be in a position marked *pass* when the pattern is obtained.

A comparison must now be made between linearity and leakage of the valve being tested and a master overlay indicating permissible tolerances. A horizontal line corresponding to the percentage leakage flow is drawn on the previously prepared linearity plot, Figure 4. The master overlay is then placed over the plot and the reference line on the overlay made to coincide vertically with the leakage line on the linearity plot. The overlay may then be shifted in a horizontal direction to make all the plotted points fall within the boundaries indicated on the overlay. If they do, the valve passes.

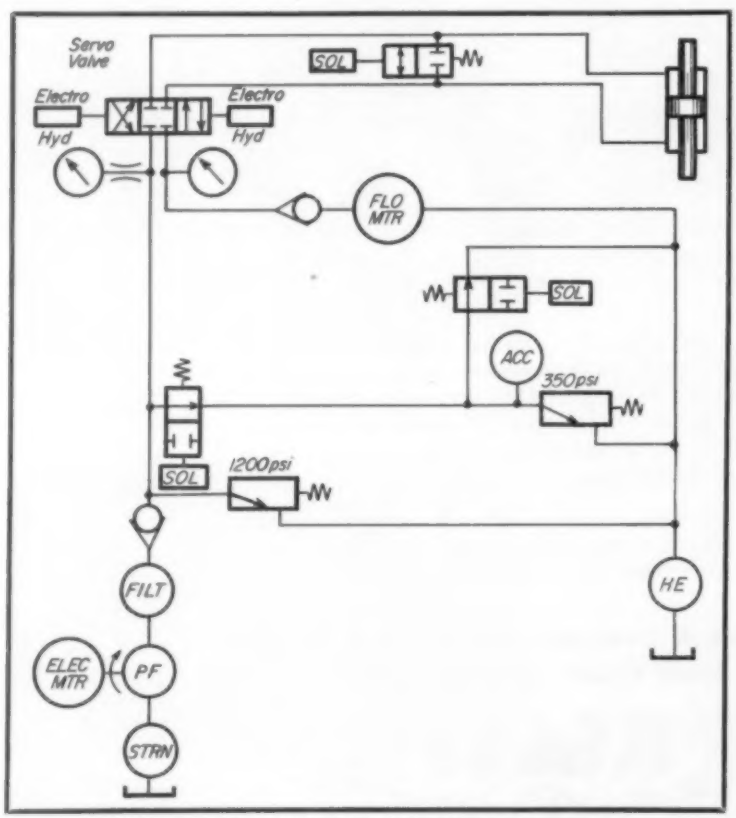


FIG. 5. SERVO VALVE TESTER hydraulic circuit.

● **Hydraulic Circuit**—Hydraulic circuit of the tester, Figure 5, is simple and straightforward. Adequate filtering, necessary for precision servo valves, is incorporated. A heat exchanger maintains oil temperature within close limits. Test results would not be consistent or reproducible if oil temperature were allowed to vary widely.

The panel selector switches actuate the solenoid valves to select proper pressure or bypass the hydraulic actuator. Actuator is bypassed for the linearity test on the valve and connected during other tests. Solenoid valve in series with the 350-psi relief valve is closed during proof pressure tests and open at all other times. Solenoid shutoff valve in parallel with the 350-psi relief valve unloads the circuit during electrical tests on the force motor coils.

Concluded on page 112

PUROLATOR FILTERS FOR THE PROTECTION OF HYDRAULIC CIRCUITS

G-200M Aircraft Restrictor Filter two-way for hydraulic oil systems metal element

PR 301 ½ GPM line type hydraulic oil filter Micronic element

PR 362 3 CFM in-line vent type Micronic element

G 200 series in-line two-way restrictor filter Metal element, internal connections

PR 312 12 GPM line type filter Micronic element

PR 412-8 12 GPM line type filter Military approval

G-187 3 GPM in-line hydraulic oil filter Metal element

P 32-26 Low pressure, high flow hydraulic oil filter

Effective filtration is essential for optimum performance in hydraulic circuits. To keep a system clean and functioning properly, it is important that the filter be designed specifically to meet the requirements of the job.

Purolator's complete line of filters for hydraulic systems includes models for every set of operating conditions likely to be encountered. A few are shown here; there are many more standard models from which to choose. If your application requires a special filter, Purolator will design and build it. Let Purolator work on your toughest filtration problem.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

CIRCLE 116 ON READER SERVICE CARD

do you have a "tight seal" problem?

By tomorrow morning, this fella's problem will be solved, except for a headache. But if you have a problem with tight seals for metal-to-metal applications, it will take more than a good night's sleep—United's Metallic O-Rings, for example.

They fit any application calling for a positive, permanent seal against internal or vacuum pressures up to 10,000 p.s.i., in a temperature range from –70 to 1800°F. They are especially adaptable for sealing cylinder heads, air and hydraulic pressures, high octane fuels, vapors, gases, oils, solvents, chemicals, acids, vacuum and steam connections. Available in various metals and plating finishes, from 3/16" dia. to any size or configuration.

Manufactured under Patent No. 2,809,269

For free 22 page booklet describing United Metallic O-Rings, write (on your letterhead please) to Department H-2

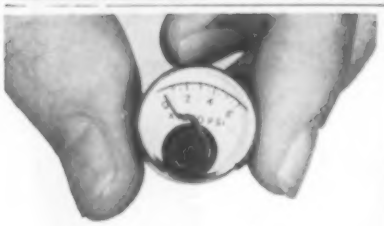
UNITED METALLIC "O" RING CORP.
Dayton, Ohio • Box 1035
Division of United Aircraft Products, Inc.

TESTING SERVO VALVES

AVIATION

• **Tester Construction**—Tester is a completely self-contained, single-cabinet unit. Only connections necessary to place it in operation are: 120 vac, 240 v, 3-phase ac and cooling water. Practically all of the electrical and electronic test components are mounted on a single chassis of the pull out type. This facilitates servicing and makes it possible to replace the chassis as a unit. A multiple connector at the back of the chassis automatically makes or breaks all electrical connections when the chassis is installed or removed.

• **Calibration**—Proper test stand calibration to insure correlation of tests on the different stands at different locations is assured by a master calibration unit. This unit stimulates maximum and minimum characteristics of the valve. It also applies standardizing frequencies, voltages and currents to the stand. This unit is easily taken from one location to another for calibration of the stands. ▼▼▼



miniaturized *bh** gauges

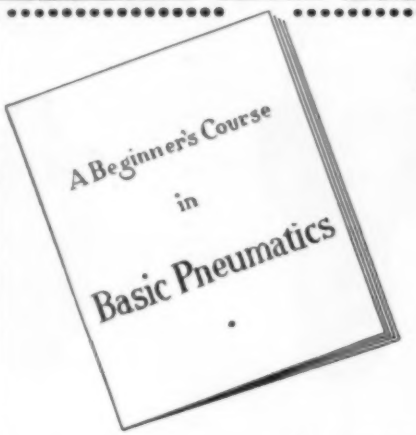
This ***bourdon helix*** gauge, designed specifically for the Hawk missile, measures 0.75 inches across. Threads directly into the pressure vessel, reads 0-5000 psi. Accuracy is ±2% of maximum, and the gauge never requires re-calibration.

When you need special gauges, remember the name GLASSCO.

Write for Bulletin G-1223

Glassco

Instrument Company
660 S. Fair Oaks Avenue • Pasadena 2, California



Again Available!

First printed in July 1954, 5000 copies of this popular booklet were bought by more than 800 companies and individuals. A second printing completed in March 1957 makes this course available to you.

$1.50 per copy

Table of Contents

Section I
Air Properties and Characteristics
Introduction 1
Atmosphere and How We Use It 6
Gas Laws; Adibatic and Isothermal Compression 9
The Efficiencies and What They Mean 14
Section II
The Distribution System
Introduction—Friction, Leaks .. 20
How to Figure Friction Losses 23
Moisture in Air Lines 29
Distribution System Accessories 31
Air Hose 37
Section III
Power and Working Elements
Air Cylinders 41
Introduction to Air Valves 49
Poppet Type Air Valves 55
Sliding Plunger Type Air Valves 58
Diaphragm Air Valves 60
Index 63
Index of Tables and Charts 66

ORDER FROM APPLIED HYDRAULICS MAGAZINE
812 HURON ROAD • CLEVELAND 15, OHIO

AVIATION NEWS

from the fluid power field

A new concern, **The Hydrodyne Corp.,** North Hollywood, Calif., has been formed to manufacture fluid control products for aircraft and missiles. The announcement was made jointly by **J. H. Overholser,** president, formerly with Pacific Division of

J. H. Overholser
The Hydrodyne Corp.

Robert T. Skinner
The Hydrodyne Corp.

Bendix Aviation Corp., and **Robert T. Skinner,** executive vice president, owner of the Skinner Seal Co. The corporation is located in a new 18,000 sq ft air conditioned plant.

Overholser stated, "we are particularly interested in high and low temperature and high pressure products for exotic fuels, atomic energy, and other difficult to control fluids and gases".

Arkwin Industries Inc. has been chosen to manufacture aircraft QPL shuttle and relief valves by **Adel Precision Products, A Division of General Metals Corp.** Both the Air Force and BuAer have agreed to this arrangement.

Fred T. Miller has been made Regional Sales Manager with **Weston Hydraulics Ltd.** Mr. Miller has almost 18 years of experience in the aircraft equipment field.

Robert R. Lent has been appointed director of sales of **Statham Instruments Inc.,** Los Angeles, Calif. Formerly district manager for Baldwin-Lima-Hamilton Corp., Lent also served for 12 years with the U.S. Air Force.

NEW RESEARCH TOOL . . .

. . . to detect and locate cavitation in fluid systems has been developed by AiResearch Mfg. Div., The Garrett Corp. Extremely sensitive, the detector has recorded bubbles 1/20 in. in diameter in a 6-in. diameter pipe. The device is

electrical and its signals can be transmitted to an oscilloscope, telemetering transmitter or some control circuit. James Clark, AiResearch engineer in charge of the project is shown here with the detector in a demonstration setup.

CIRCLE 1 ON READER SERVICE CARD

Fall . . . *the original*

SPRING LOADED

Wiper **Ring**

with SQUEEZE GRIP ACTION

True Circle wiper edge is tight against the rod at all times regardless of wear.

Fall Wipering consists of three pieces assembled into one integral unit. In use since 1944 by Military and Aviation Industry. Spec. AN6231-, AN6231A-, MS28776- 1/2" to 13" dia. Plain or Spring Loaded. Spec. MIL-S-5049 or any commercial use.

ACE PRODUCTS CO.

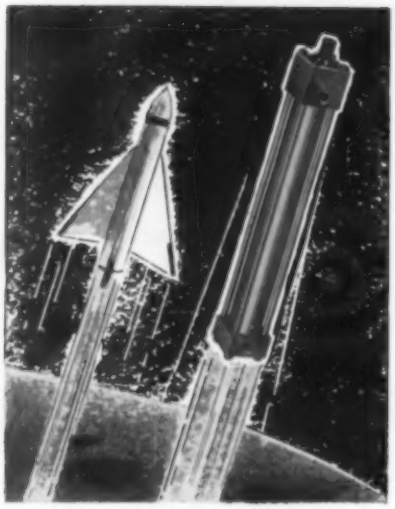
Toledo 1, Ohio Est. 1935

WHY BUY SPECIALS?

Use standard cutters for popular hydraulic port contours

One pass completes all operations necessary to produce the port contour. Job time cut as much as 3/5! All have carbide cutting edges for long life, smooth finishes. Available in all sizes. Write for prices.

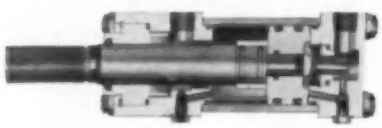
SONNET Tool and Mfg. Co. 576 North Prairie Avenue Hawthorne California



ORTMAN-MILLER Launches Another Star Performer The O-M Automation

Heavy-Duty Air and Hydraulic Cylinders
1000 PSI Hydraulic — Series RH
200 PSI Air — Series RA
available in 1½" to 8" bores

Meets JIC and Automotive Industry "Automation Standards"



Any resemblance between a guided missile and an O-M AUTOMATION cylinder is purely coincidental. However, each stands as a symbol of progress in its own field.

In the Series RA and RH air and hydraulic cylinders O-M has incorporated many advanced features in an extremely rugged line of cylinders designed to meet automotive industry specifications for Automation cylinders. The advanced design of these cylinders makes them well suited for severe applications in all types of machinery and equipment.

For detailed information, consult your local O-M representative or see our new catalogues No. 107 for Air Cylinders—No. 108 for Hydraulic Cylinders.

Mail coupon below for your copy!

ORTMAN-MILLER MACHINE CO.
1 143rd Street, Hammond, Indiana
☐ Have representative call
☐ Send Bulletins 107 and 108

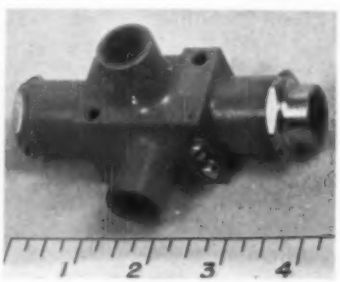
Name_____ Position_____
Company_____
Address_____
City_____ Zone_____ State_____

CIRCLE 83 ON READER SERVICE CARD

AVIATION COMPONENT DATA

Quick Release Valve
. . . for air operation

Made to military specifications, this valve opens quickly and smoothly against 3000 psi hydraulic pressure when 380 to 580 psi air

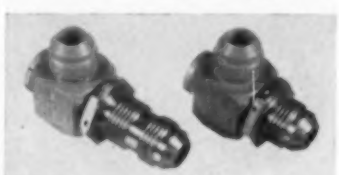


is applied to the operating port. Closing may be adjusted for 90 to 390 psi. A manually operated model is also made; operating force is 85 lb. Ports are ¼-in.—*Eureka Williams Corp., Bloomington, Ill.*

CIRCLE 500 ON READER SERVICE CARD

Right Angle Fittings
. . . swivel 360 deg

Balanced design affords low torque and operating pressures to 3000 psi. Fittings have low pressure drop and no leakage. They are for use where it is not possible



to position an elbow or where hose lines require flexibility. Fittings conform to MIL-J-5513A series 129J-100 per AND 10056 and series 130J-100 per AND 10057. Available in 3/16 to ½ in tube sizes for temperatures —65 to 300 F.—*Altair Inc., Mount Vernon, N. Y.*

CIRCLE 501 ON READER SERVICE CARD

Precision Testing

. . . of Simulated Operational G-Loadings is the title of a new technical bulletin on acceleration test machines.—*The Rucker Co., Oakland, Calif.*

CIRCLE 502 ON READER SERVICE CARD

Hydraulic Pumps
. . . for high speed, pressure, flow

First in a line of 11-cylinder pumps is the fixed displacement model PF-1110 which has a capacity of 15.8 gpm at 6220 rpm. Rated at 3000 psi it can be used for 4000 psi with a rated life of

750 hours. Features are a high-strength cast aluminum alloy housing with an elastomeric seal bonded to the cover to prevent leaks at high temperatures. All bearings have fully metallic caged balls or rollers. Pumps are pressure and temperature compensated.—*Vickers Inc., Detroit, Mich.*

CIRCLE 503 ON READER SERVICE CARD

Solenoid Valve
. . . has multiple use

It may be used as a 2 or 3-way, continuous duty solenoid valve for air, hydraulic, and fuel pressures to 400 psi. It has low current drain

and has been tested for 500,000 cycles without leaking. While the

valve is a low cost industrial type, it meets all military specifications for aircraft and missile ground handling equipment.—*Vinson Mfg. Co., Van Nuys, Calif.*

CIRCLE 504 ON READER SERVICE CARD

Seal

. . . has dual purpose

This seal also acts as a spring with a controlled load of 20 lb ±2 lb at .040 in deflection. It has been tested to 75 million compression

cycles without failure. The seal shown is 5 in. O.D. made for a high temperature jet engine application. It can be made in ½ to 33 in sizes for high pressure and temperature service.—*Skinner Seal Co., Los Angeles, Calif.*

CIRCLE 505 ON READER SERVICE CARD

Flow Control Valve

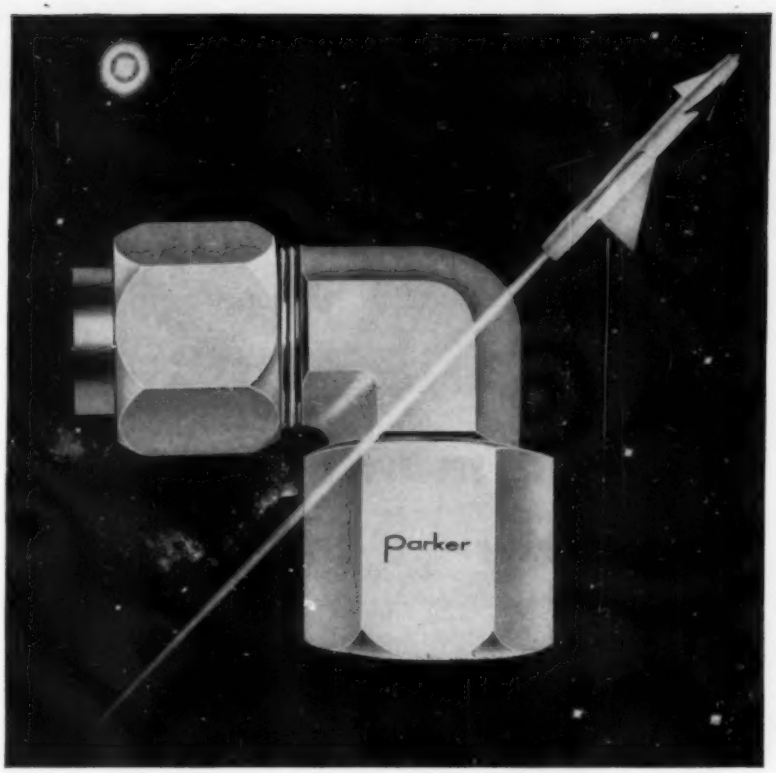
. . . for 650 F

Valves are made in ¼, ⅜, ½, and ¾ in. tube sizes and meet the requirements of MIL-V-5523-B. Operating temperature is —65 to 275 F but it can be modified for

650 F service. Operating pressure is 4000 psi. Valve is pressure and temperature compensated and has a very small differential between cracking and reseat pressure.—*Arkwin Industries Inc., Westbury, N. Y.*

CIRCLE 506 ON READER SERVICE CARD

Continued on next page



Parker Triple-lok fittings stand up under severest temperatures and stresses

Exhaustive tests by Parker and by missile builders prove that Triple-lok tube fittings stand up under the severest punishment of rocket stresses and strains, high pressures and temperatures . . . give you leakproof, dependable, *safe* connections.

Used on missiles and launching pads, Triple-lok fittings simplify construction, provide trouble-free connections, last longer. No matter how close the quarters, or how intricate the system, Triple-lok fittings are fast, easy to install.

Will even hold helium. Parker Triple-lok fittings can be furnished with specially treated flare nose surface that will trap even elusive helium, which no ordinary metal-to-metal seal can do.

The industrial standard. Triple-lok fittings come in a wide range of sizes and shapes (including *straight* threaded and *female* pipe threaded bodies). Available in type 316 stainless steel; in other alloys on special order. Warehouse stocks in all industrial centers. Ask your Parker Distributor for Triple-lok Catalog No. 4310, or write to —

PARKER FITTINGS AND HOSE DIVISION

Section 430-B, Parker-Hannifin Corporation, 17325 Euclid Ave., Cleveland 12, Ohio

Parker Hannifin
creative leader in fluid systems

CIRCLE 85 ON READER SERVICE CARD

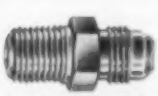
meet Mr. Flexon®

a good man to know when you buy hydraulic hose

FLEXON REUSABLE FITTINGS save time and money. All are equipped with Easy Grip Hex on stem for safe, speedy insertion into hose without the use of special mandrels.

FLEXON CRIMPED-ON FITTINGS are factory attached to provide complete hose assemblies to your specifications.

FLEXON DYNALOCK FITTINGS are the ultimate in a clamp type reusable fitting.



FLEXON ADAPTORS, UNIONS & CONNECTORS are available in a complete range of sizes and types for all services.

We're all looking for the best value, these days. But when it comes to hydraulic hose connections, a lot of factors have to be weighed to properly evaluate the overall value received. So let's take a look at these factors:

1. FIRST COST—mighty important, but it's rarely that you get a bargain on the basis of first cost alone.
2. LENGTH OF LIFE—when figured in conjunction with first cost you begin to get a better measure of actual cost.
3. EASE OF INSTALLATION—if you have difficulty assembling the hook-up for your requirements you can wipe out all the savings in Factors 1 and 2.
4. MANUFACTURER'S SERVICE — from the standpoint of prompt delivery and even more so from the standpoint of the technical aid, the service the manufacturer gives can provide the greatest value of all.

What does all this have to do with Mr. Flexon? He is the symbol of the Flexonics manufacturing and sales-service policies based on giving the buyer real hose value as outlined in the four points listed above. Talk to your local representative of Mr. Flexon, the next time you need hose. He's a good man to know, too.

Flexonics Corporation

HOSE DIVISION RH-15

Mr. Flexon identifies products of Flexonics Corporation that have served industry for over 56 years.

1385 S. Third Avenue • Maywood, Illinois

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

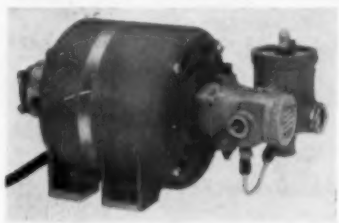
Manufacturers of metal and rubber hose, expansion joints, metallic bellows and aircraft components.

AVIATION COMPONENT DATA

Vacuum--Pressure Pump

. . . for pre-flight test

The unit has a dry air vane type pump which will deliver 400 cipm of free air at 30 psi, and an oil-wetted rotary vane vacuum pump which will pull 0.2 in. Hg absolute



or 1200 cipm free flow with no vacuum. Pumps are mounted at opposite ends of an electric motor which can be furnished for 110-volt 60-cycle ac or for 400-cycle current. The unit is complete with starting capacitor and relay.—*Lear-Romec Div., Lear Inc., Elyria, Ohio.*

CIRCLE 507 ON READER SERVICE CARD

Three-Way Valve

. . . weighs 3 oz

The valve was made for small actuators and instrumentation systems and is designated BF42C. Operating pressure is 70 psi and

power required is 9 watts at 28 v dc. It can be used for liquids or gases and can be made with ¼-in. AN ports. If toxic gas is used, the vent can be plumbed with a threaded port.—*Eckel Valve Co., San Fernando, Calif.*

CIRCLE 508 ON READER SERVICE CARD

Continued on page 118

CIRCLE 76 ON READER SERVICE CARD

First choice of the rocket and missile industry...

Three superlative Marsh products are widely used and approved by the aircraft and missile industry:

MARSH Pressure Gauges...
because they combine the most advanced features ever found in pressure, vacuum and compound gauges. There is a Marsh Gauge for every conceivable application.

MARSH Needle Throttling Valves...
because they are guaranteed to give micrometer regulation at HIGH pressures—pressure up to 10,000 psi—and any temperature up to 500° F.

MARSH Dial Thermometers...
because they offer the precision and accuracy a precision industry demands. Most complete line; wide temperature ranges, dial sizes, patterns, finishes.

All Marsh products available with AND threads

MARSH *New catalog covers all details*

MARSH INSTRUMENT CO. *Sales Affiliate of Jas. P. Marsh Corp.* **Dept. 19, Skokie, Ill.**
Marsh Instrument & Valve Co., (Canada) Ltd., 8407 103rd St., Edmonton, Alberta, Canada. Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas

Model ES4-KM2 ½ actual size

ONE-WAY IMPULSE SWITCH
simplifies sequencing circuits

- ★ Eliminates Interlocking Switches and Complicated Actuating Dogs
- ★ Exclusive one-way actuator sends electrical pulse when depressed, then opens circuit. No pulse on actuator return.
- ★ Gives More Dependable Operation — replaces complicated controls
- ★ Lowers Cost of Control Circuits—fewer switches required
- ★ Faster Automatic Operation — closer sequencing possible

10 amps, 125v AC
Four models available with pulsing strokes from 1/16" to 3/8".
Described in Data Sheet ESF-6

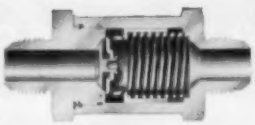
$10.50
plus 25c shipping
Write for Quantity Discounts

ELECTRO SNAP

ELECTRO-SNAP SWITCH & MFG. CO.
4224 W. Lake St., Chicago 24, Ill.

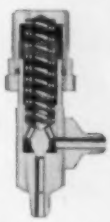
ground support and test equipment

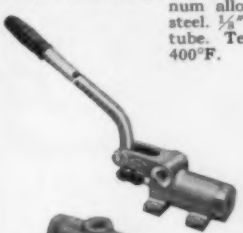
REPUBLIC VALVES



FREE-FLOW CHECK VALVES
No leakage. 3000 psi. Very low pressure drop. Can be furnished to open at ¼ to 35 psi. Brass, stainless steel, or aluminum alloy. ⅛" to 2" pipe or tube. Temp. range -65° to 200°F.

RELIEF VALVES
Quick unloading, smooth operation. Guided shut-off piston with stainless steel or Nylon seat. Pressure range to 4000 psi. Brass, aluminum alloy, or stainless steel. ⅛" to ¾" pipe or tube. Temp. range to 400°F.

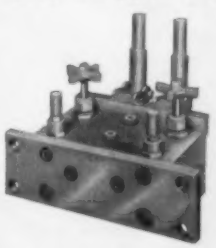




HAND PUMP
For hydraulic applications on missile carrier and support equipment. Double-acting. 2 cu. in. displacement per cycle. 1000 psi. working pressure. Aluminum alloy body, stainless steel trim. -65° to 160°F.

LEVELATOR VALVE
For automatically maintaining height and level condition in any vehicle with air spring suspension. Controls swaying in transit, and off-level position while standing. Applicable to trucks, buses, trailers, carriers, cranes, etc.

LO-TORQ SELECTOR VALVES
Smooth, easy operation, with low turning torque because of pressure balancing design. 0 to 6000 psi. Bronze, steel, or aluminum alloy. ⅛" to 2" pipe or tube. 2, 3, 4 ports.



DUAL HAND PUMP
2 pumps, 2 relief valves, and 2 needle shut-off valves, compactly manifolded for elevating mechanisms, hydraulic applications on ground support equipment, etc. Aluminum alloy body, stainless steel trim. -65° to 160°F.

Distributors in principal cities coast to coast

CHECK RELIEF SELECTOR GLOBE NEEDLE PLUG

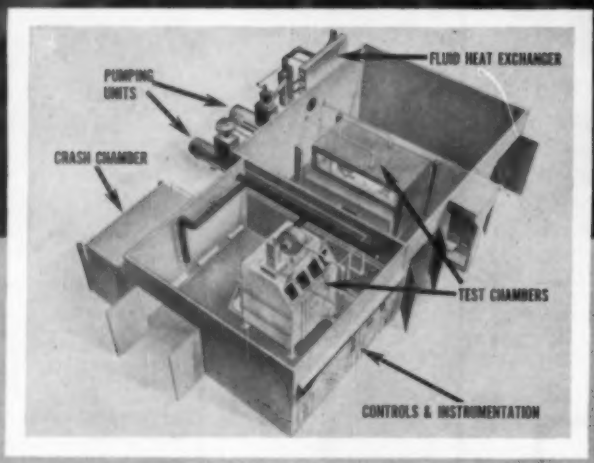
RM **REPUBLIC MANUFACTURING CO.**
15655 BROOKPARK ROAD • CLEVELAND 35, OHIO

CIRCLE 37 ON READER SERVICE CARD

CIRCLE 94 ON READER SERVICE CARD

HOT AS HELL

FOR HYDRAULIC TESTS AT BENDIX-PACIFIC



800°F HYDRAULIC FLUID TEMPERATURE

–100°F TO +1200°F AMBIENT TEMPERATURES

This is the present temperature test range available at Bendix-Pacific in its development work on servo valves and standard hydraulic components.

The High Temperature Test Facility at Bendix-Pacific is a self-contained department where all data is obtainable for complete qualification of products. The facility is equipped with unusual safety precautions. Pressures up to 5000 psi and flows to 37 gpm can be maintained. The facility can handle fluid temperatures to 800°F when the fluids become available.

Such engineering facilities assure complete development of Bendix-Pacific hydraulic products from design concept through final qualification.

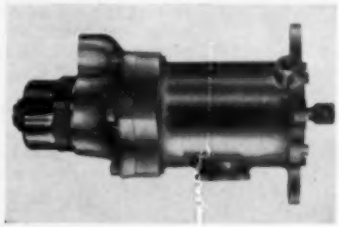
Bendix
PACIFIC DIVISION
Bendix Aviation Corporation
NORTH HOLLYWOOD, CALIF.

AVIATION COMPONENT DATA

Hydraulic Pump

. . . for 700 F

Model 69WO30 pump has a capacity of 3 gpm and can pump fluids at 450 F. Made of stainless steel and special alloys it was designed for aircraft and missile use



where ambient temperatures reach 700 F. The pump is the result of 5 years of high temperature research. —*Watertown Div., New York Air Brake Co., Watertown, N. Y.*

CIRCLE 509 ON READER SERVICE CARD

Valves and Pressure Switches

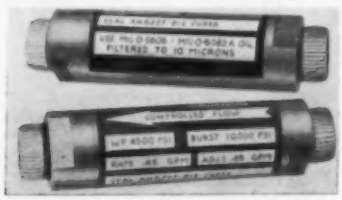
. . . for rockets, missiles, and other aircraft are covered by bulletins incorporating all pertinent specifications. Sizes, weight, pressure ratings, etc. are all listed.—*Robertshaw-Fulton Controls Co., Bridgeport Thermostat Div., Milford, Conn.*

CIRCLE 510 ON READER SERVICE CARD

Flow Control Valve

. . . with 10,000 psi burst pressure

Dimensions of this ¼-lb valve are 1-1/16 in. dia by 3-½ in. long. Made with ¼ or ⅜-in. tube ports,



it will control flows of .25 to .75 gpm. Operating pressure is 4500 psi and burst pressure is 10,000 psi. Free flow in the non-controlled direction is 4 gpm at 125 psi. Valve will operate in any position and has a temperature range of —60 to 160 F.—*Gilco Inc., Pasadena, Calif.*

CIRCLE 511 ON READER SERVICE CARD

CIRCLE 133 ON READER SERVICE CARD

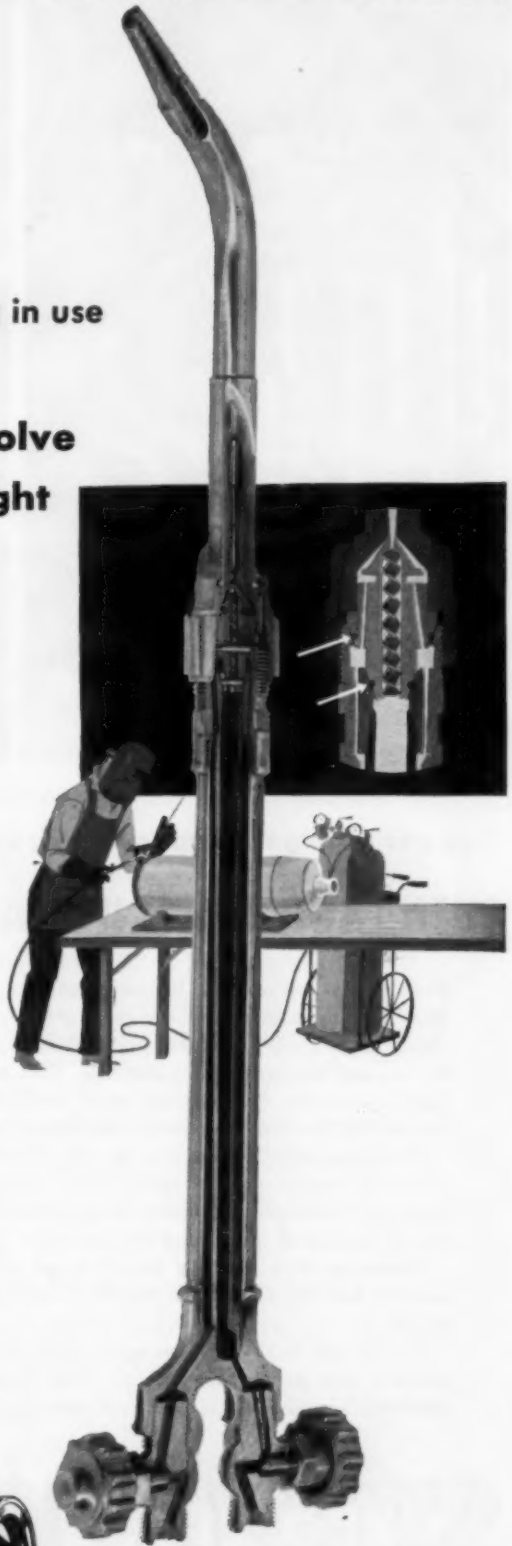
Ozone deterioration

Continuing stress

Gas leakage

Rough handling in use

New National Hypalon O-rings solve these problems; insure a hand-tight gas seal in Victor Torches



As static seals, commercial Buna N O-rings performed satisfactorily in Victor welding torches — *when the rings were new.*

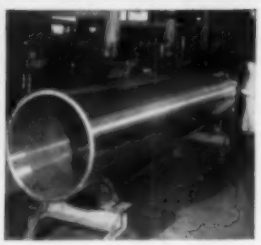
However, ordinary O-rings age fast in welding torches. They receive rough treatment when welders change nozzles; nozzles are often dropped on the ground to lie there until needed again. Severe ozone deterioration is experienced. Continuing stress, although mild, impairs O-ring elasticity. Rings on welding nozzles are sometimes subjected to long shelf life.

National Seal engineers developed a new O-ring compound, National Hypalon L-11, which not only withstands rough handling, ozone deterioration and stress but exhibits many times the shelf life of Buna N compounds previously used. Today, National Hypalon is standard at Victor.

Special compounding to meet unusual conditions is a basic part of National's complete O-ring engineering service — service available from National Field Engineers in major cities nationwide.

NATIONAL SEAL
Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California
Plants: Van Wert, Ohio, Redwood City and Downey, California

CIRCLE 81 ON READER SERVICE CARD



You get stronger, longer-lasting components with

SHENANGO CENTRIFUGAL CASTINGS

Even under the severest hydraulic service, you'll always get peak performance from Shenango centrifugally-cast components. They have a uniform, *pressure-dense* grain which makes for unusual strength and wearability. They are remarkably free from inclusions and porosity. And you'll find a *minimum* of machining is needed to attain a *maximum* of finish.

Shenango offers you cylinders and all symmetrical components in a wide range of sizes, shapes and dimensions . . . in most any non-ferrous metal or tough Meehanite metal . . . and rough-machined *or* finished to your exact specifications.

Shenango also offers a broad range of centrifugally-cast tubular bar stock to meet standard *and* specialized requirements.

For the full story on Shenango's modern centrifugal casting process and products, write to: *Centrifugally Cast Products Division,* The Shenango Furnace Company, Dover, Ohio.

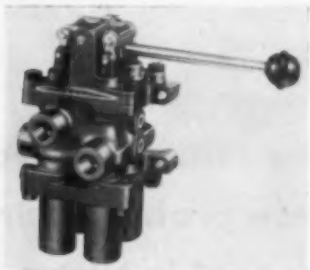
SHENANGO CENTRIFUGAL CASTINGS

COPPER, TIN, LEAD, ZINC BRONZES • ALUMINUM AND MANGANESE BRONZES
MONEL METAL • NI-RESIST • MEEHANITE METAL • ALLOY IRONS

NEW PRODUCTS

4-WAY VALVE
. . . for water service

Design: Valve is for pressures to 1000 psi and has ½ in NPT ports. It is available in 3 and 4-way closed center types, and was de-



signed for use with raw water, oil, or glycol-base fluids.

Bubble tight sealing is assured by hand-lapped metal-to-metal seats. Valve body is cast bronze, seats and stems are stainless steel, and centering springs are Inconel. Molded Hycar packers provide tight sealing and resistance to wear. Valve has three 7/16 mounting holes.

Sinclair-Collins Valve Co.
Akron, Ohio

CIRCLE 304 ON READER SERVICE CARD

AIR FILTER-LUBRICATOR GUARD
. . . protects personnel

Design: Guard is a specially wound spring with clips which snap over the pipe and hold it in place. It

permits the operator to see the bowl but protects against pressure failure of the bowl from heat, mechanical damage, or solvent. The guard is designed to fit all size air line lubricators and filters. The unit can be quickly removed when it is necessary to remove the bowl.

Compressed Air Service Co.
Dayton, Ohio

CIRCLE 305 ON READER SERVICE CARD

Continued on page 122

advertisement

air circuitry:

a sales tool for you—Air is booming as an industrial control medium. Air Circuitry* has recently been applied to jobs where it never would have been considered a few years ago! Westinghouse pneumatic engineers have designed and installed Air Circuitry systems for original equipment which have boosted production and cut time and labor expenses for a wide variety of industries including electronics, textiles, automobiles, chemicals, and aircraft.

The benefits of advanced air control are well known among plant engineers. But you can apply these advantages with the same happy results in *your design* of machinery used in manufacturing operations.

SELLING ADVANTAGES—No other medium offers such safety . . . such dependability. Above all, only air can offer such economy: the medium is free and available in limitless supply; the devices are not expensive; and repairs can be made easily by unskilled personnel. These are all-important factors—factors which *sell* factory and machine shop supervisors!

SEE FOR YOURSELF. We'll send a qualified control engineer to your plant. He will show you if and how pneumatic control can improve your present design, and he'll estimate the cost of conversion. If we can't give you simpler, more reliable controls, you don't owe us a cent; our service is free.

Let us study your control systems. Let us improve them, with air. Just write to Westinghouse Air Brake Company Industrial Products Division, Dept. GL-6, Wilmerding, Pennsylvania. Give us a description of your line of machinery, and the type of control it is now using. We'll do the rest.

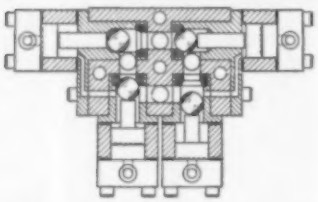
Remember, Westinghouse has led the world in the design and manufacture of pneumatic devices for more than 90 years. We bring world-wide experience to the solution of your control problems. We bring world-wide service to those who use machines equipped with Westinghouse Air Circuitry.

*AIR CIRCUITRY is the Westinghouse term for application of pneumatic control systems to industrial production operations.

NEW PRODUCTS

NEW 4-WAY VALVE DESIGN . . . relieves shock pressure

Design: The valve has 4 hardened steel balls which are pressed against hardened steel seats for closing the fluid passage. All four-way valves are identical for use as a 2 or 3-position valve. The 3-position valve has a center position where all the balls are seated and the ports



blocked. The 2-position valve shifts through the center position without hesitation. The balls are pressed against their seat by small hydraulic cylinders which are pilot operated.

The area of the piston in each small cylinder is twice the contact seat area of the ball. When shock pressure behind any ball exceeds twice line pressure, the ball will unseat relieving the shock and permitting the fluid to escape to drain.

Almar Hydraulic Valve Co.
Cleveland, Ohio

CIRCLE 306 ON READER SERVICE CARD

CARDWELL STANDARD HYDRAULIC POWER UNIT

SEVERAL HUNDRED POSSIBILITIES! Now, from one Cardwell Catalog, you can specify a "tailored-to-fit" Hydraulic Power Unit from a combination of Cardwell standard parts.

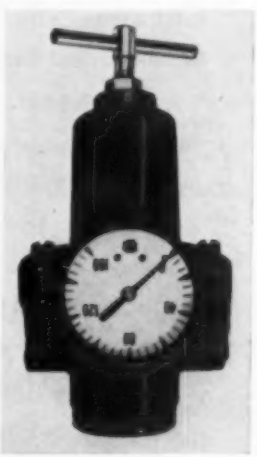
WRITE TODAY for this catalog which describes the new Cardwell Hydraulic Program in detail, including drawings, specifications and price sheets.

DEALERS and DISTRIBUTORS will want this new program, too! One catalog gives you a complete line of Standard Hydraulic Power Units. Write or phone . . .

The CARDWELL MACHINE COMPANY
Franklin at 19th St., Richmond 11, Virginia • Phone Milton 4-4593

AIR PRESSURE REGULATOR . . . has 5 to 125 psi range

Design: Large valve port gives greater capacity than previous models. Designed to provide sensitivity and accuracy in pressure control, the regulator maintains a constant uniform working pressure and safeguards against damage due to pressure surges. Its pressure range is 5



to 125 psi. Design permits removal of entire valve assembly (by hand, without use of tools) for cleaning. Unit is self-bleeding, permitting instant adjustment of pressure.

It was developed for use with Gits matched-set lubricator, filter, and regulator combination but may be used in any air line lubrication system.

Gits Bros. Mfg. Co.
Chicago, Ill.

CIRCLE 307 ON READER SERVICE CARD

SHAFT SEAL . . . is all Teflon

Designation: Type 20

Design: The main sealing member is a bellows of pure Teflon integrally molded with a sealing face of filled Teflon. The sealing face

Continued on page 24

No break-in... no run-in period with IPC "square shoulders"

IPC's square shouldered cup and "U" packings are *formed to the shape your leather packings will take under high pressure.*

What does this mean? In terms of the many high pressure applications for small cylinders which operate on fast cycles it means *immediate sealing.* No break-in or run-in period is necessary.

You will not be reshaping the shoulders of conventional leather cup or "U" packings to assure positive sealing. More . . . you'll eliminate excessive strains and resulting weaknesses of the leather by not having to reshape your packings in the application.

IPC "endgrains" and molds leather packings in both cup and "U" shapes from the world's finest materials. Whatever your packings problems . . . it's worth the time to check IPC's "custom approach." A complete and experienced engineering staff is available to assist you with any sealing application.

IPC

Packings
Oil Seals
Precision Molding

INTERNATIONAL PACKINGS CORPORATION
Bristol, New Hampshire P3

CIRCLE 40 ON READER SERVICE CARD

NEW Multiple Relief And Selector Valve

- Two adjustable differential piston type relief valves operated by valve selector permits individual selection of three clamping pressures.—
  - ECONOMICAL
  - DEPENDABLE
  - GOOD PRESSURE-FLOW CHARACTERISTICS
- For Oil
- Flows — Up to 10 GPM
- Pressure Ranges 100 to 5000 psi.
- ⅜ "O" Ring Seal Straight Thread Ports.

Complete Specifications Available on Request

Fluid Controls, inc.

Manufacturers of Hydraulic Valves and Devices

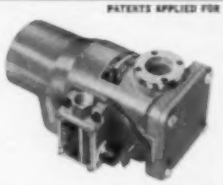
Relief Valves • Check Valves • Restrictor Valves
Needle Valves • Pilot Check Valves • Special Valves
Pressure Compensated Flow Regulators

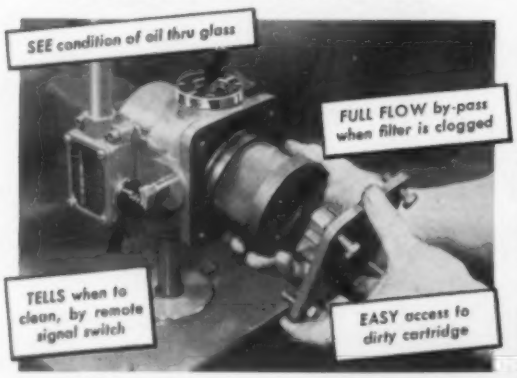
1284 N. CENTER ST. • MENTOR, OHIO • BL 5-2625

Member of National Fluid Power Association

Oil filters that tell when they're dirty... will never starve a pump... are easy to clean... are full flow

PATENTS APPLIED FOR



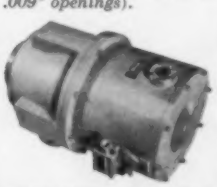

SEE condition of oil thru glass
FULL FLOW by-pass when filter is clogged
TELLS when to clean, by remote signal switch
EASY access to dirty cartridge

Above: 20-gpm Tell-Tale unit. Can be upped to 40 gpm with pleated filter cartridge. 50-gpm and 75-gpm Tell-Tale units (not shown) are also available.

Left: Removing the filter cartridge from a 5-gpm Tell-Tale unit. Pleated filter rating for this same unit is 10 gpm. While the optional electrical limit switch indicator is shown here, the visual indicator model is also available.

Below: 100-gpm Tell-Tale filter. Pleated filter rating is 200 gpm. All cartridges, plain or pleated, are available in five different degrees of filtration (from .0008 to .009" openings).

Rosaen Tell-Tale® units do more than filter. They indicate when the filter needs cleaning. And if ignored they by-pass oil to protect the pump (and they indicate this, too). Filters are necessary, but the high cost of filter inspection is not. Get the filter that tells when to clean, and never starves a pump. Write for more information.



The ROSAEN COMPANY

1776 EAST NINE MILE ROAD • HAZEL PARK, MICHIGAN

Dealers: Write for information

NEW PRODUCTS

and the opposed mating face material may be varied to suit specific liquids, temperatures, and pressures. The springs which maintain contact

of the sealing faces are Teflon-sleeved, so that no metal is exposed to the liquid.

For internal mounting, a double-ended seal is used and the entire assembly is floated between the opposed sealing faces. For external mounting, a single faced seal is used and the rotating member is secured to the shaft with a metal clamp. Made in ¾ to 2 in sizes.

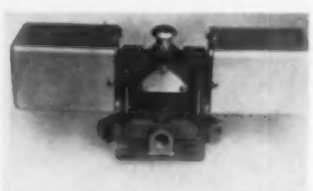
Crane Packing Co.
Morton Grove, Ill.

CIRCLE 308 ON READER SERVICE CARD

4-WAY SOLENOID AIR VALVE . . . plugs-in to sub-base

Designation: Model P/N220155

Specifications: Port sizes are ½ in NPT dry seal. Valve body is cast aluminum and is designed for 100



psi air pressure but will withstand surge pressures of 250 psi.

Features: The entire valve mechanism may be replaced by plugging a new valve body into the base and tightening 4 bolts. Electrical leads are attached to a junction box in the base and the valve has prongs that form the contact.

Whittaker Controls, Division of Telecomputing Corporation
Hollywood, Calif.

CIRCLE 309 ON READER SERVICE CARD

Continued on page 126

Saves hours in piping installations

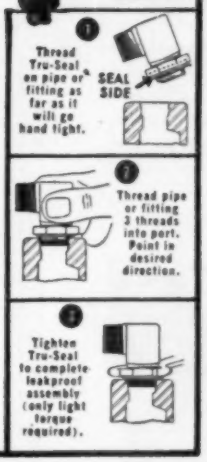
Eliminates leaks in oil, air, water, vacuum, chemical lines

Tru-Seal saves hours in assembling piping installations because it enables you to run your pipe lines in any direction you wish, quickly and easily—without having to recut and re-thread piping sections. Wherever used on air, oil, water, steam, vacuum or chemical lines, it seals perfectly at —100° F. to plus 500° F.—*without the use of pipe dope.* Its installation requires only light tightening torque, thus eliminating over-tightening damage to valves, pumps, compressors, and other fittings.

For further information write

TRU-SEAL DIVISION
FLICK-REEDY CORPORATION
2008 N. Hawthorne, Melrose Park, Ill.

"Miller Fluid Power" is also a Div. of Flick-Reedy Corp.


1
Thread Tru-Seal on pipe or fitting as far as it will go hand tight.
SEAL SIDE
2
Thread pipe or fitting 3 threads into port. Point in desired direction.
3
Tighten Tru-Seal to complete leakproof assembly (only light torque required).

New infinitely-variable, multi-range

FLOW CONTROL

in 3 standard sizes

New precision Flow Control solves today's highly particular demands for uniform feed-rate on machine tool applications. Features—infinitely-variable control to permit setting full scale to exact maximum required by the system. Exceptionally sensitive flow selection with safe, simple, fool-proof operation. Eliminates flow change due to temperature-viscosity change. Multi-range control allows one model to meet all flow control requirements. No surge overtravel when hydraulic feeds are engaged. Built-in relief valve saves space. Built-in check valve permits reverse free flow. Requires no external drain. Three standard sizes—¼", ⅜", ¾". Built to JIC standards for operating pressures to 2000 psi. Write for details. Bulletin VFC-3. Denison Engineering Division, American Brake Shoe Co., 1166 Dublin Road, Columbus 16, Ohio.

new 6"x3"

WAGNER HYDRAULIC BRAKE SYSTEM

Provides sure stops for smaller cranes

Wagner now offers a new 6" x 3" size hydraulic brake to provide the correct braking system for floor operated pendant controlled cranes, monorail cranes or small cab operated cranes. These hydraulic brakes will stop your cranes safely . . . easily . . . economically.

Let your nearby Wagner Sales Engineer help you put the *right* braking system on your small or large cranes—let him help you with tension control or hydraulic actuating problems—call him today, or write for Wagner Bulletin IU-226.

W158-3

Wagner Electric Corporation
6387 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

MIGHTY MIDGETS

. . . that SAVE SPACE and WEIGHT when You AUTOMATE!

MAC-38D
Double Ram, Double Acting Air Cylinder

MAC-38S
Spring Return, Single Acting Air Cylinder

MAN-12
12-Port Manifold

MAV-2 & 3
2 and 3-Way Air Valves

You are sure to find these miniature but MIGHTY pneumatic cylinders, valves and accessories most useful for automatic work and control applications, especially where savings of weight and space are a MUST!

Clippard's versatile line of air components are "precisioneered" for millions of cycles of trouble-free operation. Small and easily mounted, they fit most anywhere to help automate your present work operations, or to improve equipment you are now designing.

Put these mighty midgets to work for you, NOW, to increase production and improve work quality AUTOMATICALLY.

WRITE TODAY FOR FREE LITERATURE AND ATTRACTIVE PRICES!

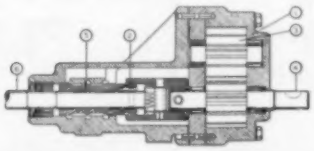
Clippard INSTRUMENT LABORATORY, INC.
7380-H Colerain Road, Cincinnati 39, Ohio
Manufacturers of R.F. Coils, Electronic Equipment, Miniature Pneumatic Devices

NEW PRODUCTS

HYDRAULIC SERVO MECHANISM
. . . for rotary motion

Designation: 2000 Series

Features: Unit was designed for power steering on heavy vehicles but can be used wherever a rotary servo motion is required. Economy and simple installation are achieved by combining controller and actuating parts into one unit.



Operation: A spool valve assembly acts as both the mechanical and hydraulic coupling between the input and output shaft. Fluid is diverted to either side of the gear motor as the spool shifts laterally under the control of the spool sleeve cam slots. Flow is continuous in the system but is not pressurized until 1 lb force is exerted at the steering wheel. The manual steering effort is the signal for the working force.

Construction: Featured in the construction of the unit are: (1) Body casting, (2) cam slot and pin shifting mechanism, (3) gears, (4) output shaft, (5) controlling spool-type valve, (6) input shaft.

Specifications: A volume of 4½ gpm and a pressure of 800 psi are required for operation. Maximum speed is 60 rpm and output torque is 650 lb-in. Power consumption is 2.1 hp.

Behlen Mfg. Co. Inc.
Columbus, Neb.

CIRCLE 310 ON READER SERVICE CARD

The ARROW AUTOPNEUMATIC

CONTROL **is the answer**

to your compressed air problems

Write for Free Catalog

ARROW TOOLS, INC.
1934 S. Kostner Ave.
Chicago 23, Illinois

HYDRAULIC FILTER
. . . has Monel cartridge

Designation: M-2032-100

Features: Filter is designed for in-line installation and will handle up to 25 gpm of hydraulic oil. Filter

cartridge is made of Monel wire cloth in mesh sizes from 30 to 100, and is easily removed for cleaning. It has no throw-away parts to replace.

Specifications: Length 3-⅛ in, head dia 4¼ in, case dia 3-⅛ in, and 1 in NPT ports.

Marvel Engineering Co.
Chicago, Ill.

CIRCLE 311 ON READER SERVICE CARD

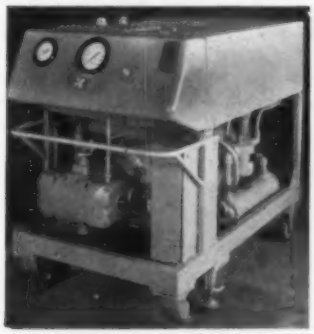
MOBILE POWER PACK
. . . for hydraulic testing

Designation: PowerPac 1041C

Features: This high pressure, high flow, hydraulic power unit combines compactness and mobility. The overhead reservoir keeps a constant supply of oil to the pump

which eliminates cavitation and assures long pump life. Remote control valves and gages are in a shock isolated instrument panel.

System includes an accumulator and a heat exchanger. Filtering includes a suction strainer in the reservoir, a high pressure in-line,



10 micron filter, and a magnetic separator in the return line. Special design features to reduce pump noise and pulsation result in low noise level. Unit is available in 10, 20, and 30 gpm models.

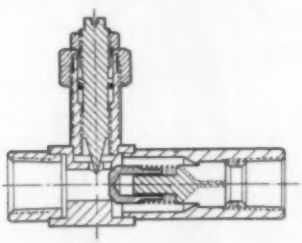
Specifications: Maximum pressure 5000 psi, capacities to 30 gpm with variable volume control.

Western Hydrodyne Co.
Los Angeles, Calif.

CIRCLE 312 ON READER SERVICE CARD

RESTRICTOR VALVE . . . has safety cap

Design: Valve consists of a check and needle valve in one body. Free flow is permitted in one direction by the check valve. Reverse flow closes the check valve forcing flow



through the needle valve. A safety retention cap prevents complete removal of the needle, and blow out of stem. A lock nut on the needle valve loads the stem in the same direction as the pressure which keeps setting constant. Valves are available in ⅜ and ¾ in pipe size for pressures to 3000 psi.

Fluid Controls Inc.
Mentor, Ohio

CIRCLE 313 ON READER SERVICE CARD

Continued on next page

SOLENOID VALVE

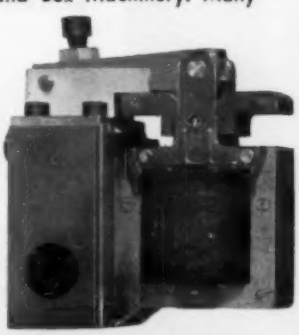
PRICES NOW REDUCED

Standard Solenoid Valves are suitable for all hydraulic systems handling non-corrosive fluids. Special Valves can be designed for corrosive fluids upon request.

They have working pressures up to 3000 psi. They are designed for remote push button control of hydraulic systems. Poppet construction eliminates leakage.

Waterman Solenoid Valves are used in material handling field, Road Building Equipment, Presses and Box Machinery. Many applications in all types of Industry have found them dependable and inexpensive.

The impregnated coils are oil and moisture resistant and units can be mounted in any position. Available in 110-220-440 A.C. and 6-12-24-36 D. C.



WRITE FOR LATEST SOLENOID BULLETINS

WATERMAN ENGINEERING COMPANY

725 CUSTER AVENUE • EVANSTON, ILLINOIS

CIRCLE 126 ON READER SERVICE CARD

Use Chemiseal® NYLON PRESSURE TUBING

outperforms metal

STRONG Types for 1000 psi and 2500 psi.

FLEXIBLE Saves flexible couplings, and intermediate fittings.

DURABLE Exceptionally high resistance to flex and vibrational fatigue. Resists abrasion and impact.

ECONOMICAL Outperforms metal at a fraction of the cost. Saves installation labor.

ADAPTABLE Sizes from ⅛" to ½" O.D. —useable with any standard metallic flare or compression fittings.

SERVICEABLE At temperatures ranging from −100°F to +225°F. Unaffected by hydraulic fluids, oils, alkalies, most solvents.

For prompt service, contact one of The Garlock Packing Company's 30 sales offices and warehouses throughout the U.S. and Canada, or write for further information.

United States Gasket Co., Camden 1, N. J.

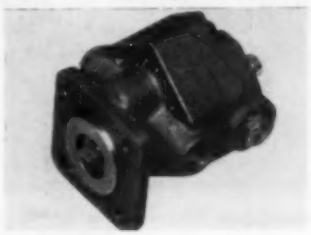
® U.S.G. Trademark

United States Gasket *Plastics Division of* GARLOCK

NEW PRODUCTS

COMPACT PUMPS
. . . with built-in valves

Specifications: Pumps are gear type made with either tang or keyed drive shaft and capacities from ½ to 3.7 gpm. They are available in four 1500-psi models, and



four 2000 psi models, and can be operated at speeds to 2600 rpm. The built-in check valve is an important feature for lift truck applications since it will keep the load from settling.

Webster Electric Co.
Racine, Wis.

CIRCLE 314 ON READER SERVICE CARD

HYDRAULIC RAM PACKING
. . . for water or oil service

Designation: Monoseal

Features: No adapters or reinforcements are needed and no gland pressure or adjustment is required. A complete coating of fabric prevents

packing swelling and binding ram. Molded of synthetic compounds it has a flared lip to assure leak proof seal at low pressures, and a thick top to withstand high pressure hydraulic shock. It can be installed in any depth stuffing box from 1½ in up.

A. W. Chesterton Co.
Everett, Mass.

CIRCLE 315 ON READER SERVICE CARD

NON-SEPARATOR ACCUMULATOR
. . . uses a free-moving float

Design: Instead of a sealed piston this accumulator uses a free-moving float to separate the hydraulic fluid from the gas charge. When the float reaches its low position it triggers a shut-off valve which retains the pre-charge. Experience has shown that the 3% of fluid exposed to the gas around the float does not change operating efficiency. Since

there are no seals or bladders to replace, maintenance is practically eliminated.

Sizes: 1 to 20 gal with working pressures to 3000 psi.

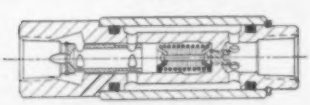
Payne Mfg. Co.
Huston, Texas

CIRCLE 316 ON READER SERVICE CARD

FLOW REGULATOR
. . . has reverse flow check valve

Designation: 194-2

Features: Valve is a pressure compensated flow regulator with an



uncontrolled reverse flow. Flow rate is factory set and is not adjustable in the field. Regulator is compact and is no larger than an in-line check valve.

Operation: A ½ in regulator set to deliver 0.1 gpm at line pressures of 75 to 3000 psi will handle a reverse flow of 5 gpm with a pressure drop of 50 psi.

Waterman Engineering Co.
Evanston, Ill.

CIRCLE 317 ON READER SERVICE CARD

CHECK VALVE
. . . for 5000 psi

Designation: 570 Series

Features: Valves are piston type and are made in brass and 303 stainless steel. They are designed for liquid or gas service and feature a positive reverse flow closure.

Specifications: Made in sizes 1/8 to 1/2 in pipe thread and 1/4 in Swagelok and 37 deg JIC flared tubing connector. Maximum operating pressure of the brass valve is 3000 psi and 5000 psi for the stainless steel model. Temperature limits are —40 to 200 deg F. O-ring is Buna-N synthetic rubber.

Hoke, Inc.
Engelwood, N. J.

CIRCLE 318 ON READER SERVICE CARD

Continued on next page

Make Good Design Even Better . . .

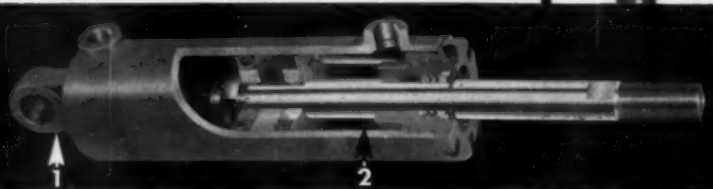
BHEW Made-to-Order HYDRAULIC CYLINDERS

Whatever your cylinder requirements, you're sure of dependable operational performance with efficient, close-tolerance BHEW cylinders that require minimum mounting space. Built to meet your specifications, their cost is reasonable; there is no charge for tooling; they are delivered on schedule.

BHEW CYLINDER FEATURES: • Standard and special designs available. • Double or single acting and telescopic. • 1½" to 8" bore. • Strokes up to 156". • Smallest possible O. D. and retracted O. A. length. • Oil cylinders with 1,500 psi or 3,000 psi working pressure, pneumatic up to 150 psi. • Cup-type, ring-type or O-ring construction. • Choice of mounting.

Double-Acting 2-piece Piston Rod Cylinder. It is excellent for extending and retracting boom arm. Both hoses are connected on rod end. →

1. Hinged mount for alignment.
2. Honed steel cylinder.

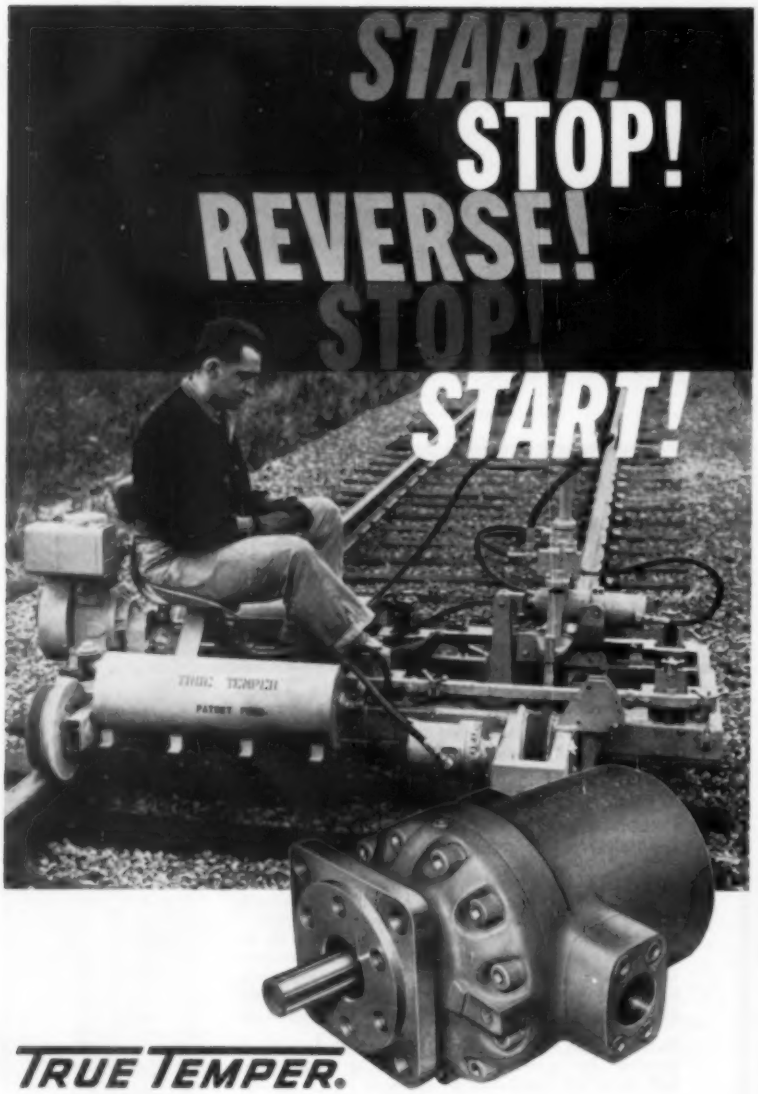


WRITE for your copy of Hydraulic Cylinder Engineering Reference Data Manual. Can save you hours of time in specifying cylinders. 40 dimensioned basic designs for general and special purpose double acting cylinders.

BENTON HARBOR ENGINEERING WORKS, Inc.

BHEW
622 LANGLEY AVENUE, ST. JOSEPH, MICHIGAN

CIRCLE 17 ON READER SERVICE CARD



TRUE TEMPER.

does it with **High-Torque**

BERRY Motors

High torque, instant reversibility, small size with light weight—these Berry Motor characteristics contribute to the 500 to 700 anchor per hour speed of the *True Temper Hydraulic Rail Anchor Machine.* Direct-connected to two drive wheels, the motors produce immediate response, speeds to 20 mph and excellent performance on grades.

Let us send engineering data. Ask for Model A bulletin!

BERRY HYDRAULICS

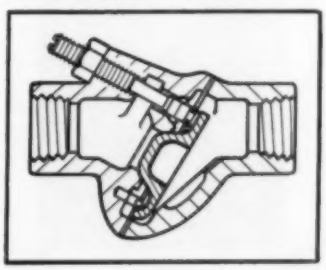
A DIVISION OF OLIVER TYRONE CORPORATION
GENERAL SALES OFFICE: OLIVER BUILDING
PITTSBURGH 22, PA

NEW PRODUCTS

FLOW CONTROL VALVE
. . . uses nylon flapper

Designation: Micro-Trol

Features: Valve is low cost and permits precise control of air, gas, or low pressure hydraulic flow with unrestricted return. Lower range of flow is metered by adjusting the position of the ground cylindrical stem within a concentric bore in the valve body. As the regulating portion of the stem clears the bore, the stem contacts the nylon flapper, lifting it off its seat. Flow is then controlled by the clearance between



the flapper and its seat. On return the flapper lifts clear giving unrestricted flow.

Specifications: Valves are made in sizes ¼ to ¾ in. Valve body is cast bronze, stem is stainless steel, and the flapper is molded nylon.

Valvair Corp.
Akron, Ohio

CIRCLE 319 ON READER SERVICE CARD

PRESSURE SWITCH
. . . is stripped model

Designation: Model 402

Features: Switch was made primarily for OEM and industrial installations where controls are

mounted in a common cabinet. It can mount in any position and is not sensitive to vibration.

Specifications: Recommended for oil, gas or water systems, the switch

CIRCLE 18 ON READER SERVICE CARD

is made in proof pressures of 30 in mercury vacuum to 150 psi. It can be adjusted to sense any pressure from 30 in Hg vacuum to 100 psi. UL listed single pole, double throw switch for AC and DC circuits are automatically reset by the snap action of the switch.

Barksdale Valves
Los Angeles, Calif.

CIRCLE 320 ON READER SERVICE CARD

4-WAY AIR VALVE
. . . uses rotary solenoid

Features: Valve is designed for spot welders, pneumatic tools, and other air powered circuitry. Because of its small size, it can be mounted at the cylinder, eliminating long air lines. Balanced internal

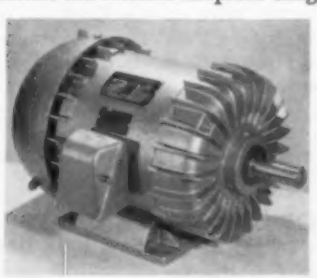
pressure is used to increase life. The valve has been tested at more than 25 million cycles. Change of direction in air flow takes place in less than ½ cycle at 60-cycle frequency. It has ¼ in ports and meets all JIC specifications. Provision is made for optional mechanical operation.

Square D Co.
Milwaukee, Wis.

CIRCLE 321 ON READER SERVICE CARD

ELECTRIC MOTORS
. . . in new NEMA frames

Features: This line of electric motors has recessed neoprene sling-



ers on the output shaft, a fool-proof lubrication system, stainless steel connection and name plates, and shock resistant fan covers. Line includes totally enclosed and explosion-proof motors from 1 to 500 hp. A balanced insulation system makes the motors impervious to moisture and corrosion. Oversize conduit boxes are standard for easy installation.

Specifications: Available in the new NEMA frames through 365U, the old NEMA frames through 505, and standard industrial frames above 505.

A. O. Smith Corp.
Electric Motor Div.
Tipp City, Ohio

CIRCLE 322 ON READER SERVICE CARD

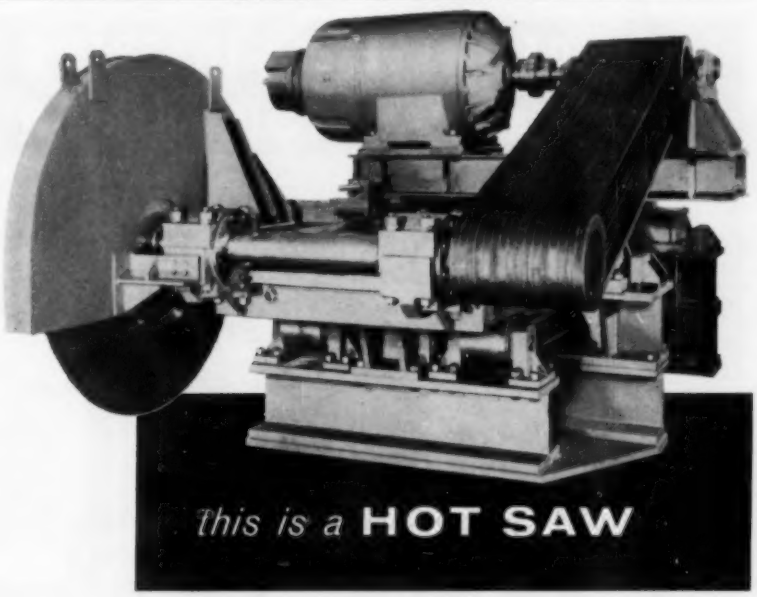
HIGH PRESSURE BALL VALVES
. . . for −32 to +400°F

Designation: Double-Seal, Style "H"

Features: Valves have unit-body construction and can be turned on or off with ¼ turn of handle. Ball design allows full-flow with a minimum pressure drop, and permits leak-proof sealing.

Specifications: Available in ¼ to 1½ in tube thread and ½ to 2 in pipe thread. Valves are made in

Continued on next page



It cuts hot steel rounds up to 7" in diameter. The saw blade, its motor drive and the carriage on which they are mounted total 30,000 pounds.

For cutting, the carriage is reciprocated hydraulically. It advances at an adjustable fast idle speed, changes over to a slower adjustable cutting speed and then returns at high speed to its initial position.

This is done smoothly and accurately with **Lassman equipment and a Lassman engineered hydraulic circuit** that eliminate the need for a multiplicity of valves to achieve the desired control.

Let us show you how we can provide a simpler way of doing the more difficult jobs hydraulically. And let us also acquaint you with the advantages of Lassman heavy duty hydraulic equipment.

Quality EQUIPMENT for *Quality* PERFORMANCE

BENJAMIN LASSMAN & SON Route 8, GLENSHAW, PA.

CIRCLE 134 ON READER SERVICE CARD

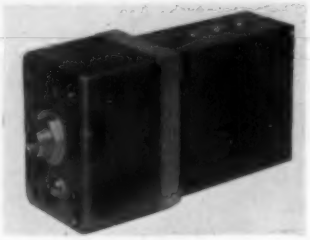
NEW PRODUCTS

carbon steel, 303 and 316 Stainless steel, with Nylon and Teflon seats and seals. They operate within a temperature range of —32 to 400 deg F.

Jamesbury Corp.
Worcester, Mass.

CIRCLE 323 ON READER SERVICE CARD

SERVO VALVE
. . . is electrically controlled



Designation: E-11089-4

Specifications: The valve is rated at 10 gpm flow at 1000 psi (assuming 1/3 pressure drop across valve) and operates on supply pressures to 3000 psi. By means of the mechanical feedback linkage it can be trimmed to handle 10 gpm with as little as 300 psi supply pressure.

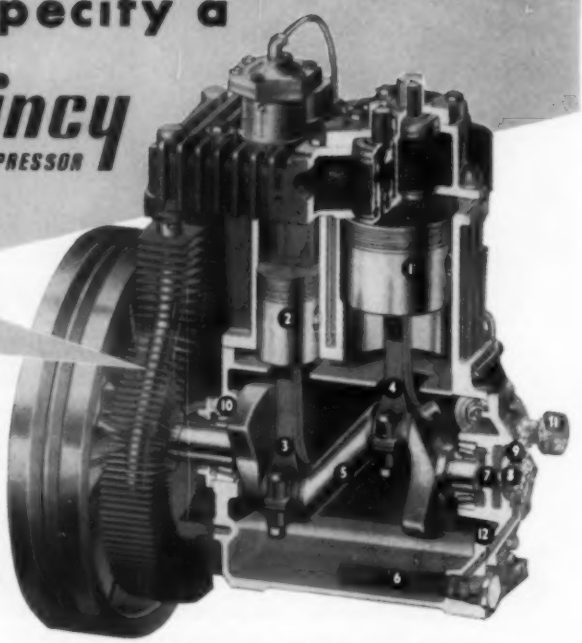
Features: Valve fills the gap between hydraulic power and electronic programming of control functions. The two-stage valve has four moving parts; main spool, control spool, sleeve, and feedback linkage. The mechanical feedback linkage with variable fulcrum makes the valve flexible for various conditions of flow, response, and pressure. Only a small signal in the milliamp range is required for control.

Vickers Incorporated
Detroit, Mich.

CIRCLE 324 ON READER SERVICE CARD

INCLUDE THESE ENGINEERING ADVANTAGES IN YOUR DESIGN

. . . specify a Quincy COMPRESSOR



1 - 2. Four-ring, light weight automotive-type low and high pressure pistons.

3 - 4. Strong, light weight Lynite connecting rods.

5. Balanced crankshaft with integral counterweights.

6. Oil inlet screen.

7. Drive shaft for new rotary vane-type oil pump.

8. Four-vane oil pump.

9. Self-reversing pump valve.

10. Oversize Timken roller bearings.

11. Easy-reading oil gauge.

12. Intake oil passage in bearing carrier and crankcase.

Here are just some of the design features of Quincy's new Model 325 — one of a complete selection of industrial air compressors to 90 C.F.M. capacity.

SEND FOR CATALOG TODAY

Quincy COMPRESSORS
COMPRESSOR COMPANY
Dept. AH-658,
Quincy, Illinois

Gentlemen: Please send free catalog of industrial air compressors.

NAME _____
FIRM _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

AIR PILOT VALVE
. . . operates directional valve

Designation: Pulse-Air Poppet

Operation: Valve may be operated by hand or mechanical means, direct or remote. It releases a measured amount of air from the pilot chamber of the directional valve shifting the spool.

The Pulse-Air valve opens and closes when the plunger is depressed. It is not necessary to release the plunger before the directional valve is energized in the other direction. Valve was designed for automatic machine tool equipment.

The Lithibar Co.
Holland, Mich.

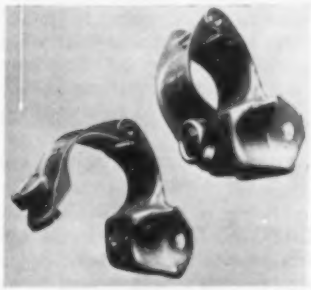
CIRCLE 325 ON READER SERVICE CARD

QUICK OPENING CLAMP
. . . for supporting fluid lines

Designation: 7C

Features: Clamp was designed for holding hose, hydraulic and pneumatic lines, and conduit, and can

be permanently mounted with a bolt or rivet. The clamp is held closed by a quarter-turn fastner



which allows quick opening and positive resistance to shock and vibration. Available in sizes ⅜, ½, ⅝, and ¾ in, it is made of corrosion resistant material and has rounded edges to guard against cutting or scratching.

Camloc Fastner Corp.
Paramus, N. J.

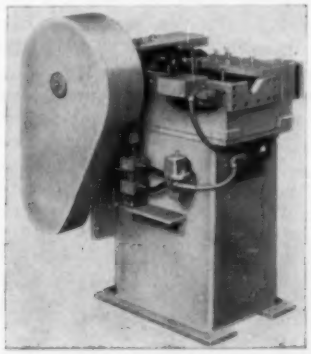
CIRCLE 326 ON READER SERVICE CARD

To receive a copy of
THE FLUID POWER PRIZE PAPER
RULES BOOKLET
Circle 240 on Reader Service Card

FLARING MACHINE
. . . gives uniformity and high speed

Designation: Model B-2

Operations: Clutch is engaged by an air cylinder actuated by a solenoid valve. The tubing is gripped by two steel dies. The bulging punch first strikes the end of the



tube. It is then retracted and the flaring punch strikes. The dies open and the clutch disengages automatically.

Automation Associates Inc.
Madison Heights, Mich.

CIRCLE 327 ON READER SERVICE CARD

CIRCLE 6 ON READER SERVICE CARD

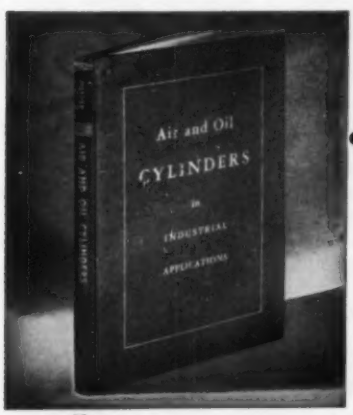
free catalog

47-page catalog illustrating complete line of
AIR CYLINDERS,
AIR VALVES,
AIR CLAMPS,
DIAL FEED TABLES

ALLEN AIR

The cylinder of "distinction" shown above is a Factory Reject. Only straight rods available.

THE A. K. ALLEN CO. AH-6
225 East 2nd Street, Mineola, N. Y.
Name.....
Company.....
Address.....
City..... Zone..... State.....



AIR & OIL CYLINDERS

Elmer Heiser has written this valuable cylinder handbook which tells about types, cushions, how to order, proper porting, correct sizing, packings, and efficient installation methods.

It's full of application ideas.

PRICE $5.00

The Industrial Publishing Corporation
812 Huron Road • Cleveland 15, Ohio

"Wipe out" PACKING FAILURES WITH Seal-Guard METALLIC ROD WIPERS

Self-adjusting, easy to install, Seal-Guard's knife-like bronze rings "wipe off" all dirt and grime, will not mar the rod, are oil and heat resistant and friction-free.

HOW SEAL-GUARD WORKS

1. Twin wiper rings are mounted on rod with notches staggered.
2. Cushion ring is compressed on assembly exerting constant inward pressure keeping ring in constant contact with rod.
3. Harmful substances are completely cleared by scraper action.

Seal-Guards are available to fit rod diameters from ¼ to 24 inches. Other sizes by special order.

WRITE FOR DESCRIPTIVE LITERATURE.

HYDRAULIC ACCESSORIES CO.
24301 Hoover Rd. Van Dyke, Mich.

USEFUL LITERATURE

SOLENOID VALVES . . . in 2, 3, and 4-way types are detailed in a condensed catalog D2 from *Skinner Electric Valve Div., The Skinner Chuck Co., New Britain, Conn.* Catalog is designed to aid in the fast selection of the company's standard valves. It contains a numerical listing of all valves plus mounting dimensions and operating pressures.

CIRCLE 411 ON READER SERVICE CARD

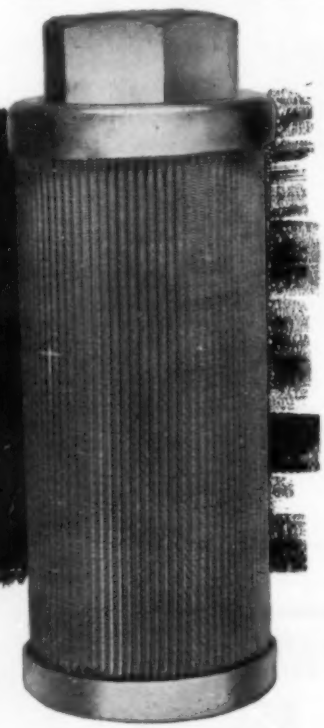
AFTERCOOLER SYSTEMS . . . are described in a 4-page bulletin issued by *Jas. A. Murphy & Co., Inc., Hamilton, Ohio.* It explains the operation of the system which contains the aftercooler, separator, and trap. Also included is a chart giving capacities, pipe sizes, overall dimensions, and sq ft of cooling surface.

CIRCLE 412 ON READER SERVICE CARD

Capital

HYDRAULIC OIL FILTER with Monel Metal Insert

Reservoir Type for Hydraulic and Oil Re-circulating Machinery



EASY TO INSTALL—EASY TO CLEAN
LONG LIFE—LOW COST—SIZES AND SCREENS TO FIT YOUR NEEDS

★ ONLY THREE PARTS
★ MEETS J.I.C. STANDARDS
★ GREATER FILTERING AREA
★ SPECIAL TRAP-WEAVE MESH

Specially woven MONEL wire cloth and a new method of compact corrugation, gives triple protection with less space than other filters of like capacity. Trap-weave mesh stops thin, elongated particles with NO loss of efficiency.

Non-corrosive, non-toxic materials throughout. Easily cleaned with an ordinary brush.

Write for descriptive circular.

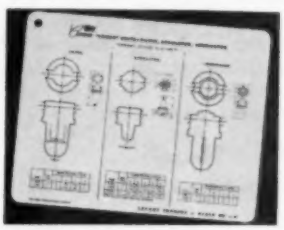
CAPITAL ENGINEERING & MFG. CORP.

5836 SOUTH ASHLAND AVENUE, CHICAGO 36, ILLINOIS

HYDRAULIC PUMPS . . . with elliptical tooth form designed specifically to pump fluids are explained in a bulletin from *Hupp Aviation Co., Chciago, Ill.* It illustrates how the mating teeth of the gears do not trap oil. This eliminates noise and pulsations and permits the pumps to be operated at speeds over 3500 rpm.

CIRCLE 413 ON READER SERVICE CARD

LAYOUT TRACERS . . . for filters, lubricators, regulators, and accessories are available from *Hannifin Co., Division of Parker-Hannifin Corp., Des Plaines, Ill.* Outlines



of the units are shown to scale (⅛ in = 1 ft, ¼ in = 1 ft, and ½ in = 1 ft) to make it easy for the designer to trace-in. There are 8 cards in the set, which comes in an envelope with instructions printed on the outside.

CIRCLE 414 ON READER SERVICE CARD

HYDRAULIC CLAMPING . . . is detailed in a catalog published by *Power Jacks Ltd., Hemel Hempstead, Herts, England.* Included is an engineering section which covers the advantages and disadvantages of various clamping methods, and complete sizing data for pumps, cylinders, and clamping fixtures.

CIRCLE 415 ON READER SERVICE CARD

HYDRAULIC TUBING . . . used for cylinder walls and fluid lines is described in a 4-page buyer's guide published by *Joseph T. Ryerson & Son, Inc., Chicago, Ill.* The guide lists types, analysis, wall thickness, stock lengths, typical applications, machinability, and relative cost.

CIRCLE 416 ON READER SERVICE CARD

CHECK OIL LEVEL . . . with window units. Used for visual observation of oil supply and operation of internal machine parts, these units are described in a 4-page leaflet, No. 8-E, prepared by *Bijur Lubricating Corp., Rochelle Park,*

N.J. Included are specifications and part numbers for both glass and plastic windows in 5 sizes, from ⅜ to 3¾ in. Installation data and pressure and temperature limits are given.

CIRCLE 417 ON READER SERVICE CARD

SOLENOIDS . . . for use on valves, pumps, and clutches are shown in a booklet prepared by *Controls Company of America, Schiller Park, Ill.* It has a section on how to select solenoid for various applications, and complete dimensional and electrical information. Also included are curves on current consumption and pull in pounds.

CIRCLE 418 ON READER SERVICE CARD

AIR VALVES . . . are detailed in a 108-page general catalog offered by *Numatics, Inc., Highland, Mich.* For easy use the catalog is divided into four sections; 4-way valves and manifolds, 2 and 3-way line valves, manual valves and manifolds, and pilot and special valves. Included are handy valve selection charts and JIC symbol diagrams.

CIRCLE 419 ON READER SERVICE CARD

ADJUSTABLE FLOW REGULATOR . . . and high pressure solenoid valve are described and illustrated in two catalog sheets issued by *Fluid Power Accessories, Inc., Glenview, Ill.* The sheets give complete engineering data including sizes and capacities of the 3000 psi valves. Flow regulators are pressure compensated.

CIRCLE 420 ON READER SERVICE CARD

AXIAL PISTON PUMPS . . . for high pressures and variable displacements are shown in a 14-page catalog from *Mannesmann-Meer Engineering & Construction Co., Easton, Pa.* It includes outline drawings, typical applications, and exploded views of the company's complete line of pumps, which have capacities of 40 to 1135 gpm and pressures to 2840 psi.

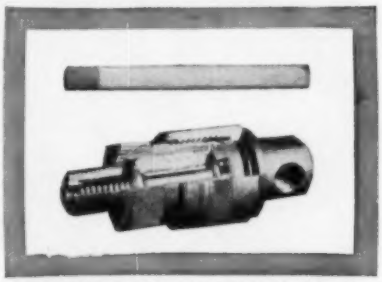
CIRCLE 421 ON READER SERVICE CARD

INDICATING FLOWMETERS . . . are described in a two-color bulletin V-100 available from *Seico Instrument Div., Eclipse Fuel Engineering Co., Rockford, Ill.* Included in the bulletin are ranges, scales,

Continued on next page

CIRCLE 62 ON READER SERVICE CARD

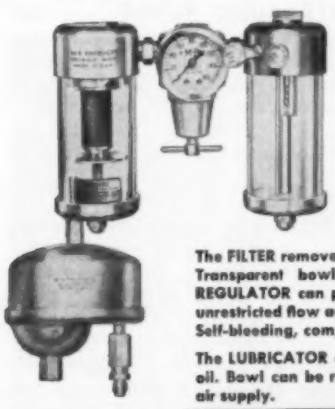
NOW TRY **HUSCO**
Hydraulic Control-Engineering for Improved Performance, —Space and Cost-Saving



Every Husco Hydraulic Control is custom-engineered for your equipment! We have no "standard" models to push. But our successful experience with hundreds of difficult control problems—confirmed by case histories—promises you the *right* control for your needs . . . Control Valves, Check Valves, Reciprocating Valves, Hydraulic Cylinders, Pumps, Power Units—they're all engineered to your specific equipment demands for size, capacity, performance.
Check HUSCO *first* for precision engineered Hydraulic Units. You'll save time, money and worry. Write for details.

HUSCO
HYDRAULIC UNIT SPECIALTIES CO.
Pumps • Valves • Cylinders
P. O. Box 257-A, Waukesha, Wis.

GREATER PROTECTION to your AIR LINE!
M-B
WHIRL-A-WAY FILTER, REGULATOR AND LUBRICATOR ASSEMBLY AND AUTOMATIC AIR TRAP (MODEL W-4)



SUCCESSFULLY USED FOR PROTECTION OF AIR VALVES CYLINDERS CONTROLS PNEUMATIC TOOLS, ETC.

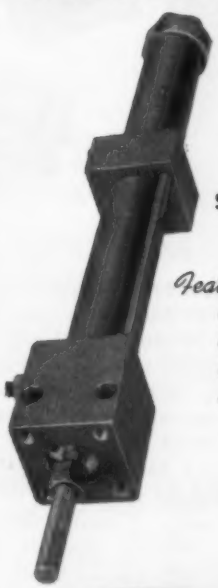
The FILTER removes solids .00039 and larger. Transparent bowl provides visibility. The REGULATOR can pass large volume with an unrestricted flow and minimum pressure drop. Self-bleeding, compact.

The LUBRICATOR delivers desired volume of oil. Bowl can be refilled without shutting off air supply.

The Air Trap is automatic and eliminates manual draining.

M·B PRODUCTS
46 VICTOR AVE., Div. 10
DETROIT 3, MICHIGAN

a NEW DASHPOT...
HYDRAULIC CHECK • SHOCK ABSORBER



Airoyal now offers a complete line of pull-type Dashpot Cylinders. These are available in 3 sizes, for pull loads of 480, 1200 and 3000 pounds. Standard strokes for each size are 2", 4" and 6".

Features:
- May be mounted in any position
- Low controlled-speeds
- High return-speeds
- In-line integral oil reservoir

Dashpot Cylinders carry the standard Airoyal guarantee: they are unconditionally guaranteed against breakage—forever!

THE AIROYAL MFG. CO
FLUID POWER EQUIPMENT
1990 SPRINGFIELD AVENUE
MAPLEWOOD, NEW JERSEY

CIRCLE 77 ON READER SERVICE CARD

CIRCLE 4 ON READER SERVICE CARD

One source for component parts really pays off... coordinated shipments, the same high quality standards, one responsibility are just a few of the many advantages. H-P-M is the source for a complete line of pumps, power units, valves, cylinders and system accessories. H-P-M's experience background in the design and building of hydraulic systems can be a real help when needed. Write today for a complete catalog. Ask for Bulletin 1101. Make H-P-M your standard for savings.

H826

HPM

HYDRAULIC POWER DIVISION
THE HYDRAULIC PRESS MFG. COMPANY
A DIVISION OF KOEHRING COMPANY • MOUNT GILEAD, OHIO, U. S. A.

CIRCLE 61 ON READER SERVICE CARD

USEFUL LITERATURE

pressures, and mechanical details. It also contains an explanation of the movable vane principle, and the three systems of indication used in the mediums being measured.

CIRCLE 422 ON READER SERVICE CARD

CYLINDERS . . . for air and hydraulic service are described in separate bulletins issued by *Mo-Bar Hydraulic Sales, Inc., Crystal Lake, Ill.* The air cylinders are for 200 psi and the hydraulic for 2000 to 3000 psi service. The bulletins feature complete technical data, detailed drawings, and cutaway photographs of the cylinders.

CIRCLE 423 ON READER SERVICE CARD

END FACE SEALS . . . for pressures to 500 psi and temperatures to 500 deg F are shown in catalog EF-100 available from *Chicago Rawhide Mfg. Co., Chicago, Ill.* It shows typical installations for internal and external seals and outline drawings showing their construction. Seals are available from ¾ to 4 in shaft size and for speeds to 15,000 fpm.

CIRCLE 424 ON READER SERVICE CARD

FLOW METERS . . . for high pressure and temperature are described in bulletin 130 issued by *Brooks Rotameter Co., Lansdale, Pa.* Illustrations show flow meters for pressures to 5000 psi and capacities to 3000 gpm, with pneumatic, electric, and indicating transmitters.

CIRCLE 425 ON READER SERVICE CARD

HYDRAULIC PUMPS . . . and fluid motors are featured in catalog No. 111 available from *Tuthill Pump Co., Chicago, Ill.* It shows a cut-away view and performance curves covering the 7 models available. Pumps have capacities from 1.2 to 14.2 gpm and pressures to 1500 psi.

CIRCLE 426 ON READER SERVICE CARD

CYLINDERS . . . for pressures to 3000 psi are detailed in a 6 page bulletin published by *The Sheffer Corp., Cincinnati, Ohio.* It describes the new 1-⅛ in. bore cylinder and gives mounting dimensions for cylinders to 12 in. bore. The catalog lists 14 standard mounts and 4 rod end styles.

CIRCLE 427 ON READER SERVICE CARD

POST SCRIPTS OF INDUSTRY

News about people, manufacturers and sales organizations

Howard H. Deem has been named director of manufacturing for both **Valvair Corp.** and **Sinclair-Collins Valve Co.** He will direct foundry and manufacturing operations in the companys' Akron, Ohio and Canton, Pa. plants.

Howard H. Deem
Valvair Corp.

LeGrand Terry
Vickers, Inc.

To provide better service to the mobile hydraulic activities in the area, **Vickers Incorporated,** Detroit, Mich., has established a special Detroit Mobile Sales Department. **LeGrand Terry,** who joined Vickers in 1951 as a coordinator and application engineer for mobile hydraulic products, will be in charge of this new Mobile Section, Detroit office.

Louis N. Friol has been elected vice president of **Clover Industries, Inc.,** Tonawanda, N.Y. His responsibilities will cover sales and engineering.

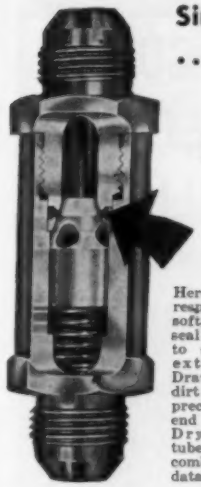
Eastman Southwest Hose & Couplings, 100 Manufacturing St., Dallas, Texas, have been appointed distributor by **Circle Clamp Corp.,** New York City, for the states of Texas, Arkansas, Louisiana and most of New Mexico.

Frank D. Riggio Co., Inc., 31 State Highway 17, Rutherford, N. J., has been appointed authorized stocking distributor for **Automatic Switch Company.**

Raymond S. Doherty has been elected vice-president of the **A. W. Cash Valve Mfg. Corp.,** Decatur, Ill. He was previously associated with National U.S. Radiator Corp.

Flexonics Corporation, Maywood, Ill., has opened its new Santa Ana Division. This is the seventh facility to be opened by the firm since 1941. The new plant is a 25,000 sq. ft. structure, designed for expansion. The company's western regional office and warehouse under manager **George Derum,** and divisional product design and development under manager **Leroy Fessler** are also located in the Santa Ana plant.

CIRCLE 68 ON READER SERVICE CARD



Simple, Secure . . . Leak-Tight! this FLEXIBLE SEAL SEAT*

Here's the secret . . . responsive action of the soft, long-lasting O-ring seal! Instantly compresses to seal internal and external pressures. Draws harmlessly around dirt particles. No costly precision parts or extra end seals. Six standard Dryseal pipe and JIC tube sizes; 12 connection combinations. Send for data sheet.

KEPNER PRODUCTS COMPANY
7321 West 59th Street • Summit, Illinois

Kep-O-seal

HYDRAULIC & PNEUMATIC
CHECK VALVES

* PATENT APPLIED FOR

COMPRESSED AIR DRYERS AND CLEANERS

VAN-AIR DRYERS purify raw compressor air—reduce moisture to ZERO-dewpoint—deliver air thoroughly clean and dry. The VAN-AIR method is unique.

There are no elements to heat, regenerate or maintain. The air actually processes itself (see diagram) it swirls through a special, multiple-acting, self-disposable desiccant that lowers the dewpoint—removes foreign particles and contamination. Dry air has hundreds of uses.

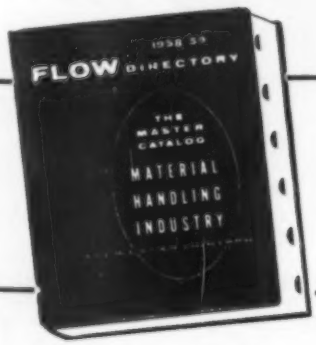
Many plants, shops and labs use the VAN-AIR to protect instruments, testers, circuits, etc. Others use it to prevent fouling of chemicals, compounds, plastics, foods, drugs, etc. Some need it to reduce spoilage in product finishing, spraying, blasting, packaging, assembling, etc. VAN-AIR DRYERS are built in various sizes.

Capacities range from small 10 scfm units to large vessels for entire plant output—up to 6000 scfm and 6000 psig. Write for brochure.

VAN PRODUCTS CO. • MFRS.
5713 SWANVILLE ROAD, ERIE, PA.

CIRCLE 121 ON READER SERVICE CARD

YOUR GUIDE TO BETTER HANDLING!



The only complete volume of authoritative information about material handling, packaging and shipping equipment and accessories. $7.50

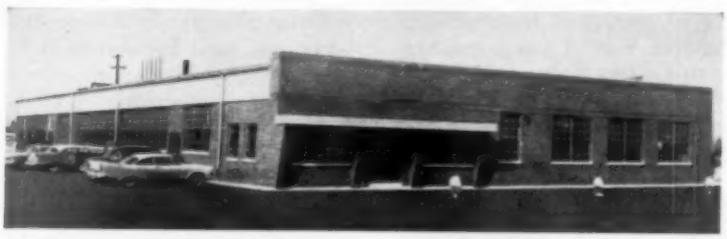
FLOW DIRECTORY
812 HURON RD. CLEVELAND 15, OHIO

POST SCRIPTS OF INDUSTRY

R. P. Adams Company, Inc., Buffalo, N.Y. selected **Blakeslee Equipment Company,** 19615 Lake Road, Cleveland as their Cleveland and Akron representative. The company will handle Adams' industrial filtration and heat exchange equipment line.

Dr. Theodore Schiffman has been named assistant manager of the propulsion and fluid mechanics research department at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Brooks Rotameter Company, Lansdale, Pa., appointed **Richard P. Homiller** as applications engineer. Homiller, who has had extensive experience in the process industries, both in the U.S.A. and abroad, will be re-



Precision Rubber Products opened a new 20,000 sq ft plant in Lebanon, Tenn. All products of the company will be manufactured in the new plant which has been equipped with the most modern machinery. The additional facility had been built to service the firm's rapidly expanding business.

PULL HYDRAULICALLY AND SAVE TIME EFFORT MONEY

THE STAR CENTER HOLE RAM eliminates need for cumbersome auxiliary rigging on many otherwise tedious, time-consuming jobs. Works in congested areas — anywhere and in any direction.

Controlled by a hydraulic pump, it pulls out shafts, pistons, pinions, bushings, cylinder liners; replaces gears, wheels, propellers; tensions cables and rods for prestressed concrete. Also used as jack for lifting, pushing, or pressing.

A threaded rod inserted through center hole is shown pulling out bushing.

Ask for Catalog No. 555

Capacities:
30, 60, 100, 150, 200 Tons

Special engineering counsel and proposals cheerfully submitted on request

Representative areas available.

STAR JACK CO., INC.
420 LEXINGTON AVE., Dept. AH, N.Y.C. 17
PLANT: RIVER GROVE, ILLINOIS

WORLD'S LARGEST ON-THE-SHELF STOCK OF HYDRAULICS

NEW PALLEY HYDRAULIC CYLINDERS — Here are two of our newly developed lines of Industrial Hydraulic Cylinders. These cylinders are designed to meet the most rigid requirements of industry. All are double action with rugged steel construction. Type (A) is a heavy duty, external cap type cylinder which ranges up to a thrust of 37,500 lbs. Type (B) is flange mounted, Press type which delivers up to 21,000 lbs. thrust at 3000 PSI. For complete listing of our prices and our tremendous stocks send for Catalog below!

A AS LOW AS 56.45

B 36.00 AND UP

4-WAY — SLIDING PISTON HYDRAULIC VALVE — A newly developed hydraulic valve which can be connected in series to operate two or more cylinders, in unison or independently. Has a built-in relief valve, adjustable up to 3000 PSI. Maximum flow of 10 GPM. 2000 PSI type at $24.50 or 3000 PSI type at $32.75

ELECTRIC HYDRAULIC PUMP MOTORS AS LOW AS 99.50

Designed to direct-couple to aircraft type hydraulic pumps. For continuous duty with high starting torque. 115/230 V, 220/440V, 1 and 3 phase, 60 cycle AC. Sizes from 3/4 to 15 HP. Complete details in Catalog below.

GOV'T SURPLUS BUYS

VICKERS HYDRAULIC ANGLE PUMPS

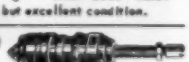
Cat. No.	GPM	PSI	RPM	Price
H-P4A	5.3	1000	3000	$22.50*
H-P5A	2.7	1500	3000	25.75*
H-P4U	6	1000	3000	22.50*

*Used but excellent condition.

SPECIAL CATALOG

396 PAGES Shows the largest stock of Hydraulic Equip. and Supplies ever stocked under one roof. Plus elect. motors, pumps, tools, etc. Send for your copy Today and SAVE!

2000 PSI HYDRAULIC CYLINDER SPECIAL Only 12.75



Genuine top quality Gov't Surplus. Used but excellent condition. Has a Bore of 2-1/4", Shaft 1", Stroke 4". Eye-to-eye lgth. 13½". Ports 1/4" AN.

Palley's

ORDER TODAY — Pay by Money Order or Check. ½ deposit with C.O.D.'s. All prices F.O.B. Los Angeles.

2263 E. VERNON AVE., DEPT. AH-68 LOS ANGELES 58, CALIF.

CIRCLE 108 ON READER SERVICE CARD

CIRCLE 84 ON READER SERVICE CARD

sponsible for new application development and liaison between field service personnel in connection with new applications.

The Weatherhead Company, Fort Wayne Division, Fort Wayne, Ind., announced these personnel changes. **John H. Allen,** sales manager of the industrial distributor division since 1955, has been promoted to sales promotion manager of the Fort Wayne Division. He will head the overall activities in market research, new products investigation, advertising programs, tech-

John H. Allen
Weatherhead Co.

John F. Hoine
Weatherhead Co.

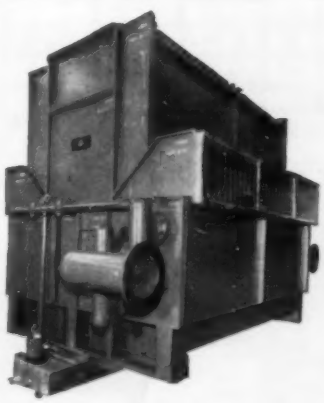
nical training schools and other procedures relating to the expansion of markets and product lines. **John F. Hoine,** sales manager of the company's farm and construction equipment distributor division since 1956 will succeed Allen. He has had a close-working knowledge of the industrial and automotive products and marketing methods. **Edmund T. Duffy** will supervise the farm and construction equipment sales division in his capacity as sales manager of the automotive distributor division.

Geoffrey Grange has been named sales manager for **C. A. Norgren Co.,** Englewood, Col. He has been a member of the Norgren sales department since January when he arrived from England. For the previous seven years he was managing director of C.A. Norgren Ltd., Norgren manufacturing licensee in England, and was instrumental for the rapid growth of the English company.

The Hilliard Corp. Elmire, N.Y., has opened a new European office in Zurich, Switzerland. **Maurice Kunstenaar,** formerly

Continued on next page

ECONOMICAL COOLING OF GASES AND COMPRESSED AIR



Cooling gases or cooling and removing moisture from compressed air, the Niagara *Aero* After Cooler offers the most economical and trustworthy method. Cooling by evaporation in a closed system, it brings the gas or compressed air to a point below the ambient temperature, effectively preventing further condensation of moisture in the air lines. It is a self-contained system, independent of any large cooling water supply, solving the problems of water supply and disposal.

Cooling-water savings and power-cost savings in operation return your equipment costs in less than two years. New sectional design reduces the first cost, saves you much money in freight, installation labor and upkeep. Niagara *Aero* After Cooler systems have proven most successful in large plant power and process installations and in air and gas liquefaction applications.

Write for Descriptive Bulletin 130.

NIAGARA BLOWER COMPANY

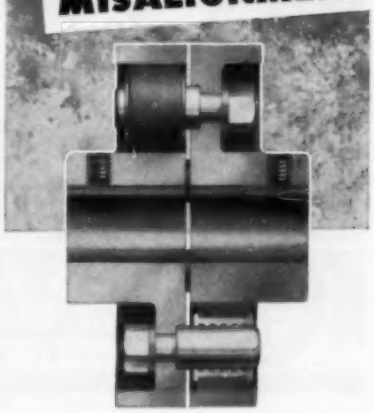
Dept. AH-6, 405 Lexington Ave., New York 17, N.Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

CIRCLE 82 ON READER SERVICE CARD

Ry AJAX

FLEXIBLE COUPLINGS CURE YOUR BREAKDOWNS DUE TO MISALIGNMENT



Usually you don't detect misalignment strains until something lets go. That's why it is good preventive practice to specify Ajax Flexible Couplings on new equipment and also install them on your present direct-connected machines. You save wear on bearings, gears, impellers, armatures, and housings.

A shut down machine can shut down a department, and that can cost a thousand times more than an AJAX Flexible Coupling.

Complete lines of AJAX bronze bushed, rubber-cushioned and Dihedral gear couplings... angular and/or offset capacity up to 7 degrees... competitive prices.

Write for catalog

AJAX

FLEXIBLE COUPLING CO. INC.

WESTFIELD, N. Y.

CIRCLE 5 ON READER SERVICE CARD

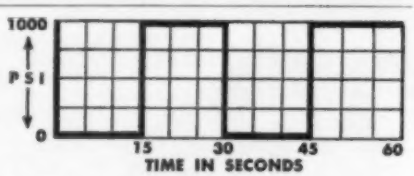
CIRCLE 30 ON READER SERVICE CARD

RUGGED
ECONOMICAL
DEPENDABLE

THE MOST REASONABLY PRICED ENGINEERED QUALITY CYLINDERS AVAILABLE

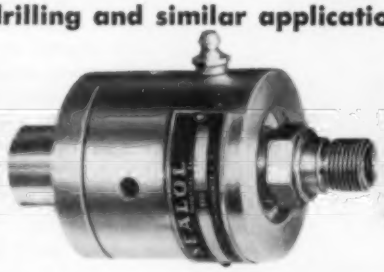
CROSS MANUFACTURING CO.
LEWIS, KANSAS ■ PHONE EA 4-5525
WRITE ✦ WIRE ✦ PHONE

Built to withstand
CYCLING PRESSURES
0 PSI to 1,000 PSI



for gun drilling and similar applications

CYCLING PRESSURES TO 1000 PSI



ROTATING SPEEDS TO 10,000 RPM

SEALOL TYPE EL FLUID TRANSFER

The high-pressure, high-speed Type EL Transfer is ideally suited for use with hollow shafts or spindles such as used in gun drill applications . . . with attachment made at end of spindle.

★ Compact . . . 3¾" OAL x 2¼" OD
★ Operating Limits . . . Liquid pressures to 1000 PSIG; speeds to 10,000 RPM; temperatures to 150°F
★ Connections . . . ¼" — 18 NPT inlet and ⅝" — 18 NF outlet
★ Minimum power requirements

The Type EL Transfer is one of several basic Sealol types designed to meet a wide range of applications, speeds and pressures. Request bulletin for complete details.

SEALOL
SEALOL CORP
156 Post Road
Providence 5, R. I.

POST SCRIPTS OF INDUSTRY

manager of the company's export department in Elmire has been transferred to Zurich. **Richard J. DeBottis** has been named assistant manager of the export department with offices in Elmire. The new Zurich office was established to provide more direct contact with the ever increasing number of European representatives and customers.

Robert R. Dickey was named sales manager of **Ross Operating Valve Co.**, Detroit, Mich. Dickey has been field supervisor of the Parker-Hannifin Corp., working out of Rochester, N. Y.

Robert R. Dickey
Ross Operating Valve Co.

Phillip Hall
A. Schrader's Son Division

A. Schrader's Son Division of Scovill Manufacturing Co., Inc., has promoted **Phillip Hall** to manager of industrial sales, with headquarters at the company's main offices. Hall joined Schrader as a sales engineer on industrial products and advanced to sales promotion manager and assistant manager of the industrial division. He recently returned from a lecture tour in England where he spoke on Air Automation.

Joseph A. Eagan announced the formation of a new company to manufacture and sell proportioning and power pumps, the **Jaeco Pump Company,** with headquarters in Villanova, Pa. Eagan has been associated with the pump industry for many years. A group of men with long experience in design, manufacture and application of pumps are associated with him.

CIRCLE 100 ON READER SERVICE CARD

CIRCLE 87 ON READER SERVICE CARD

CAT. NO. 562 CAT. NO. 1014 CAT. NO. 107

HYDRO-LATCH RAMS

Single or double acting, tonnage capacity and length of travel to meet your specifications. Has spring loaded self-engaging latch as a safety factor, positive stop in case of hydraulic failure or to hold load for indefinite period. Clevis or Trunion mountings, manufactured of heat treated alloy steel, ram is polished and hard chrome plated with adjusting screw, ram end.

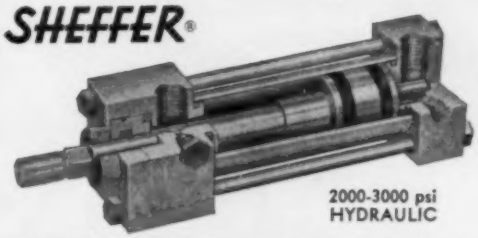
WILLIAM S. PINE

Custom Built Hydraulic Equipment and Hand Pumps

1635 E. 22nd St.
Los Angeles 11
Calif.

CIRCLE 101 ON READER SERVICE CARD

EXCLUSIVE COMPACT 1-1/8" BORE Square Head SHEFFER®



2000-3000 psi HYDRAULIC

C4H SERIES SAVES SPACE and MONEY for YOU!

This finest of the "interchangeables" can be used in many applications where, for lack of a 1⅛" bore, larger and more expensive 1½" cylinders had to be used. Ideal rugged space-savers for tooling and automation! Tapered cushions at either or both ends for positive gradual deceleration without need for adjusting screws. Also supplied non-cushioned. All steel; 14 standard mountings—4 rod end styles. Meets or exceeds J.I.C. Removable rod cartridges.

Write for useful NEW Catalog No. 658

SHEFFER® THE SHEFFER CORPORATION

Cincinnati 15, Ohio • Phone: VAlley 1-0320

Manufacturers of the industry's most complete line of air and hydraulic cylinders

SOLD BY LEADING DISTRIBUTORS NATIONWIDE

DOUBLE SELECTOR VALVE

GRESEN HYDRAULICS

A NEW GRESEN PRODUCT NOW AVAILABLE

Model DS-75

FEATURES: Cast iron body—pressure balanced spool—Easy to mount—Chrome plated spool—Optional three handle positions.

SPECIFICATIONS: Capacity—24GPM @15 ft/sec.
Pressure range—0 to 1500 PSI
All openings—¾" NPT
Shipping weight—12 lbs.

Write for literature

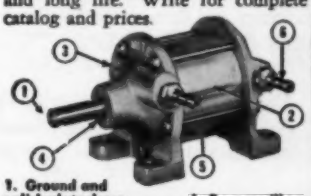
GRESEN MANUFACTURING CO.

405-35 Ave. N. E. Dept. AH-68 Minneapolis 18, Minn.

AIR-MITE AIR CYLINDERS

Low Cost...Compact...Powerful...Rugged

AIR-MITE Cylinders—made in single or double acting series—in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling or lifting is required, AIR-MITE cylinders will meet your most exacting standards of dependability and long life. Write for complete catalog and prices.



1. Ground and polished steel ram
2. Brass, true-bore cylinders
3. High strength aluminum alloy cylinder heads
4. Bronze oilless rum bushing
5. Five steel tie rods
6. Brass hose stems

4 Mounting Types

AIR-MITE Devices, Inc.

4401 W. KINZIE • CHICAGO, ILLINOIS

SECO
ISO-FLO
PUMP

Advantages

- Several *isolated* flow outputs from one pump.
- Separate pressure control of these several outputs is accomplished without complex flow control or reducing valves.
- High flow, low pressure . . . and low flow, high pressure from one pump.
- Ideal for accumulator circuits . . . Does not require delicate and unpredictable automatic unloader valve . . . Eliminates constant cycling.
- Automatic unloading characteristics permit large savings in horsepower, and greatly prolonged bearing life.
- ISO-FLO pumps will accomplish most cut-back or clamping operations better than a variable displacement pump—and at lower cost.
- Ideal for parallel feed of cylinders.
- Output of one piston may be used to control the function or cycling of remaining pistons.
- Great flexibility of flow rates is obtainable simply by adding or removing pistons.

Available in models with 7 or 14 pistons. Capacities ½ to 10 G.P.M. Operating pressures over the entire 0 to 10,000 PSI Range.

SECO

SIMPLEX ENGINEERING CO.
Subsidiary of RACINE HYDRAULICS & MACHINERY, INC.
ZANESVILLE, OHIO

POST SCRIPTS OF INDUSTRY

Promotion of **Kenneth Knapton** to product manager—hydraulics of **Sanders Associates, Inc.,** Nashua, N. H. has been announced. Associated with Sanders since 1955, Knapton will now coordinate the marketing, engineering and production functions for the company's line of electro-hydraulic valves and systems.

James H. Carmine has joined the **Fram Corporation,** Providence, R.I., as special consultant in sales, advertising, merchandising and marketing. He was previously president of Philco Corp.

MARKET PLACE

When replying to a box number in the Market Place, address your letter to Applied Hydraulics, 812 Huron Road, Cleveland 15, Ohio. Attention: Box No.

SURPLUS FOR SALE

40 Vickers Vane Type Pumps
Model #VC-108-GD3-B5
Lewis Welding & Engineering Corp.
Bedford, Ohio

PROJECT ENGINEER WANTED

By nationally known midwestern manufacturer of HYDRAULIC PRESSES and other hydraulic and pneumatic equipment. Must be graduate engineer with extensive experience (at least 10 years) in the design of presses, machinery, automation equipment, etc.
Excellent salary. A permanent career with a real future for a top man. Send resume in full confidence. Write to Box 6158 APPLIED HYDRAULICS.

HAVE YOU ANY SURPLUS FITTINGS FOR SALE?

We are interested in buying Hi-Compression Steel Fittings, primarily (W) WEATHERHEAD AND (I) IMPERIAL makes "ER" in "ERMETO" type, such as Nuts, Sleeves, Male and Female Connectors, Unions, 45 and 90 degree Male and Female Elbows, Male and Female Branch Tees, Tee Unions, Male and Female Run Tees, Bulkhead Unions, etc.
Please submit inventory lists or samples.

Hydro Fittings Sales Company
Dept. AH,
2027 S. Michigan Ave., Chicago 16, Ill.
CAlumet 5-3383

ADVERTISERS' INDEX
JUNE 1958

Ace Products Company 113
Aeroquip Corporation 17
Afco Fitting Co. 15
Air-Mite Devices, Inc. 141
Airoyal Company 135
Ajax Flexible Coupling Co. 139
A. K. Allen Company 133
American Cast Iron Pipe Company 56
Anchor Coupling Company, Inc. 5
Geo. Angus & Co. Ltd. 51
Arrow Tools, Inc. 126
Automatic Switch Company 19

Barksdale Valves ..... Cover 3
Bearings Incorporated 21
Behlen Manufacturing Company 95
Bell & Gossett Company 98
Bellows Company 41
Bendix Aviation Corp., Pacific Division 118
Benton Harbor Engineering Works 129
Berry Hydraulics 130
Briggs Filtration Company 144
Bruning Company 4

Capital Engineering & Mfg. Corp. 134
Cardwell Machine Company 122
Chicago Rawhide Manufacturing Co. 27
Chiksan Company 22-23
Cities Service Oil Company 18
Clippard Instrument Laboratory, Inc. 125
Commercial Filters Corporation 36
Commercial Shearing & Stamping Company 77
Crane Packing Company 49
Cross Manufacturing Company 140

Darling Valve & Manufacturing Company 14
Denison Engineering Division American Brake Shoe Company 47, 125
Dukes Hydraulics 12

Eastern Industries, Inc. 105
Eastman Manufacturing Company 11
Electro-Snap Switch & Mfg. Corp. 117

Flexonics Corporation 116
Flodar Corporation 90
Fluid Controls, Incorporated 124
Foster Manufacturing Company, Inc. 97
Fulflo Specialties Company, Inc. 40

Galland-Henning Manufacturing Co. Nopak Division 13
Garlock Packing Company 39

write for NEW FREE CATALOG

of Kendall—
Governaire
precision pneumatic

PRESSURE REGULATORS for Industry

The facts you need on a complete range of pneumatic pressure regulating valves and volume boosters. Here is your guide to a series of pilot-operated and direct acting regulators—in pipe sizes from ¼ to ⅜ and ¾ NPT...in supply pressures up to 250 psi. Fact-filled pages spell out the full story: characteristics • pressure ranges, ratios • applications—for 16 different models including motor operated and lever set types.

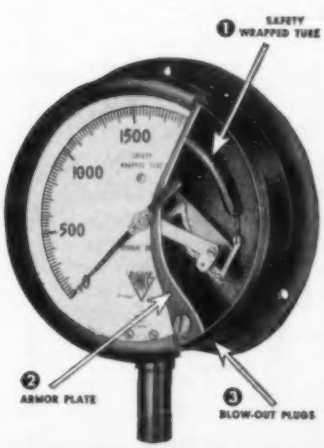
Write today for the new KENDALL- GOVERNAIRE catalog.

STRATOS
INDUSTRIAL PRODUCTS BRANCH
Route 109, West Babylon, N. Y.
A DIVISION OF FAIRCHILD ENGINE & AIRPLANE CORPORATION

Turbo-Expanders and Compressors
SPECON Variable Speed Drives and Transmissions
Pneumatic Pressure Regulators

HI-RELIABILITY GAUGES NOW CATALOGED WITH SPEC. DATA FOR HYDRAULIC APPLICATIONS...

15 p.s.i., or 30" of vacuum, to 20,000 p.s.i., including the

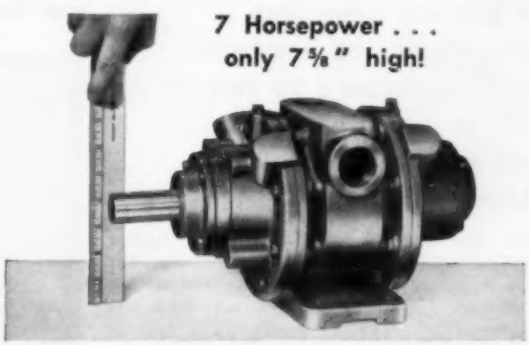


TRIPLE-GUARD SAFETY-TYPE
KUNKLE GAUGES

Backed by 50 years gauge manufacturing experience. Guaranteed accuracy. Tubes, cases and movements to specifications. Bourdon tubes in all metals as required.

NEW

WRITE FOR CATALOG & ENGINEERING DATA
KUNKLE VALVE CO. • FT. WAYNE, IND.



7 Horsepower . . . only 7⅝" high!

It's NEW! Variable-speed Model 16AM

GAST AIR MOTOR

Here's compact, explosion-proof power! Only 14⅜" x 8" x 7⅝" — wt. 65 lbs. — yet up to 7 h.p. on 90 lbs. air pressure. Speed variable from 300 to 2,000 r.p.m. with simple valve control. Overloads can't burn it out — stalling does no harm.

Has foot, also tapped holes for flange mounting to your machine. Use as original equipment or in plant to drive hoists, mixers, pumps, fans, etc. Priced at $200.

Write for your copy of Bulletin 16AM.

GAST MANUFACTURING CORP., P.O. Box 117-D
Benton Harbor, Michigan

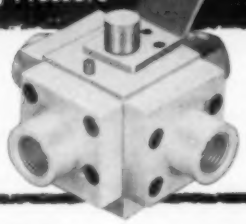
See Catalog in Sweet's Design File

GAST ROTARY
• AIR MOTORS TO 7 H.P.
• COMPRESSORS TO 30 P.S.I.
• VACUUM PUMPS TO 28 IN.

"Air may be your answer!"

NEW SPHEROTOR
4-Way Directional Control Valve

- Open or Closed Center
- 0 to 3000 psi Operating Pressure



- For High Flow Capacity With Low Pressure Drop
- Low Turning Torque
- Tight Seal

■ The new SPHEROTOR permits easy valving of fluids under high operating pressure and eliminates the need for larger valves to handle desired flow.

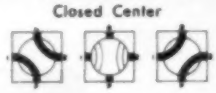
In addition to its low cost, the SPHEROTOR is small, simply constructed and easily maintained. Its metal-to-metal seals are both spring and pressure loaded for positive sealing. Individually attached ports can be selected, changed or serviced without special tools.

- Oil, non-corrosive fluids and lubricated air.
- Available off-the-shelf in ¼", ⅜" and ½" pipe sizes.
- SAE and AND ports made to order without additional cost.

FLOW PATTERNS

Open Center

Closed Center



Write for free detailed literature.

Designers and Manufacturers of Hydraulic Valves & Devices

SARASOTA Precision products inc.

1314 N. LIME AVENUE • SARASOTA, FLORIDA

IF YOU ARE DESIGNING NEW HYDRAULIC EQUIPMENT WORKING FROM 0 TO 5000 PSI . . . BY ALL MEANS WRITE FOR BRIGGS' NEW BULLETIN COVERING THIS SUBJECT

This new bulletin fully describes a rugged IN-LINE, constant, high working pressure hydraulic filter that can take SHOCK AFTER SHOCK . . . day in and day out. Made especially for conditions demanding a hydraulic fluid filter "that can take it."

See how well it will fit in with your plans to prevent sticking valves and erratic machine performance. It shows how to get FULL, EASY, SMOOTH production. Packed with practical information, specifications and drawings. Use the coupon, no cost, no obligation.

Briggs — POWERED BY MODERN OIL FILTRATION

HEAVY DUTY HYDRAULIC OIL AND FLUID FILTERS

with interchangeable cartridges for mineral oils or non-inflammable fluids . . for by-pass, in-line, or high flow installations.

PRODUCT RESEARCH

THE BRIGGS FILTRATION COMPANY, DEPT. 250, WASHINGTON 16, D. C.
SEND BULLETIN without obligation describing your heavy duty, in-line, high pressure hydraulic fluid filter.

Name .....

Company .....

Address .....

INDEX

Gast Manufacturing Corporation 143
Gits Bros. Manufacturing Company 81
Glassco Instrument Company 112
Graton & Knight Co., Inc. 44
Greenlee Tool Company 10
Greer Hydraulics, Inc. 42
Gresen Manufacturing Company 141

Hanna Engineering Works 1
Hansen Manufacturing Company ..... Cover 2
Helicoid Gage Division American Chain & Cable Company 16
Hoke, Incorporated 89
E. F. Houghton & Company 100
C. B. Hunt & Son, Inc. 37
Hydraulic Accessories Company 133
Hydraulic Power Division Hydraulic Press Manufacturing Co. 136
Hydraulic Unit Specialties Company 135

Imperial Brass Manufacturing Company 28
International Packings Corp. 123

Johns-Manville 33

Kealavite Rotary Pumps & Motors Ltd. 83
Kepner Products 137
Walter Kidde & Company, Inc. 109
Kohler Company 96
Kunkle Valve Company 143

L & L Manufacturing Company 92
Benjamin Lassman & Son 131
Linear, Inc. 84
Lisle Corporation 97

Marsh, C. W. Corporation 46
Jas. P. Marsh Corporation 117
Marval Engineering Company 63
M-B Products Division Tool Sales Company 135
Miller Fluid Power Division Flick-Reedy Corporation 45
Minnesota Rubber & Gasket Company 2

National Seal Division Federal-Mogul-Bower Bearings, Inc. 119
Niagara Blower Co. 139

Oilgear Company, The 7
Ortman-Miller Machine Company, Inc. 114

Palley Supply Company 138
Parker-Hannifin Corporation Parker Fittings & Hose Division 115
Pathon Manufacturing Company 91
William S. Pine 141
Pioneer Oilsealing & Moulding Co. Ltd. 59
Plastic & Rubber Products Company 107
Power Jacks, Ltd. 20
Precision Rubber Products Corporation 24
Purolator Products, Inc. 111

Quincy Compressor Company 132

Republic Manufacturing Company 117
Rivett Incorporated 88
Rochester Manufacturing Co. 50
Rosaen Company 124

S-P Manufacturing Corporation 52
Sarasota Precision Products 144
Sealol Corporation 140
Sheffer Corporation 141
Shenango Furnace Company Centrifugally Cast Products Division 120
Simplex Engineering Company 142
Skinner Electric Valve Division The Skinner Chuck Company 6
Snap-Tite, Inc. 61
Socony Mobil Oil Co., Inc. 34-35
Sonnet Tool & Manufacturing Company 113
Star Jack Company, Inc. 138
Stratos Division Fairchild Engine & Airplane Corp. 143
Sun Oil Company 53
Superior Tube Company 58

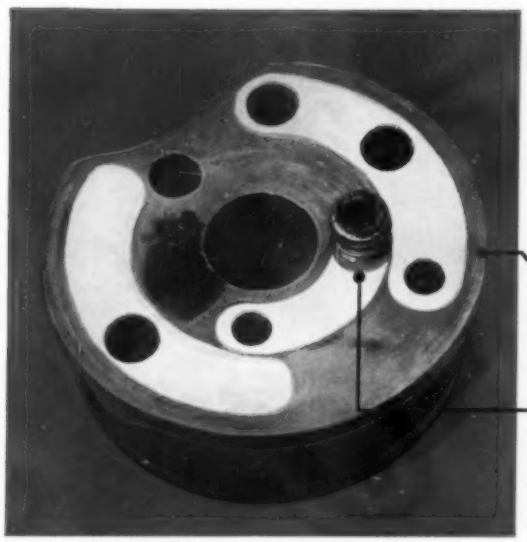
Texas Company 64
Tomkins-Johnson Company 43
Tru-Seal Division Flick-Reedy Corporation 125
Tube Reducing Corporation 54

United Metallic "O" Ring Corp. Div. of United Aircraft Products, Inc. 112
U. S. Electrical Motors, Inc. 8
U. S. Gasket Company Plastics Division Of The Garlock Packing Co. 128

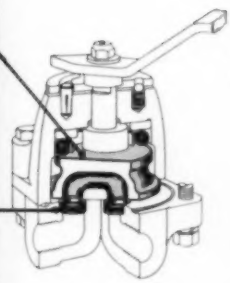
Valcor Engineering Corporation 95
Valvair, Inc. 78
Van Products Company 137
Vickers, Inc. Division of Sperry Rand Corporation 55, 87
Victor Equipment Company 29

Wagner Electric Corporation 125
Waterman Engineering Company 127
Watts Regulator Company 57
Webster Electric Company 25
Westinghouse Air Brake Company Industrial Products Division 32, 121
Worcester Valve Company 38

IN HIGH PRESSURE WATER SERVICE (3000 to 10,000 P.S.I.) ONLY BARKSDALE VALVES HAVE LASTED LIKE THIS WITHOUT MAINTENANCE



Note the mirrorlike sealing surfaces on this Dual Pressure Valve rotor after 4 years of service.



6000 P.S.I. Four-Way Standard Porting

1856 MODELS TO FIT YOUR NEEDS

4-Way, Manipulator, Dual pressure and Shut-off Valves from ¼" to 1½" N.P.T.

3000 P.S.I. Manipulator Manifold Porting

3000 P.S.I. Four-Way Straight Porting

In steel mills, on extrusion presses, die casting machines, rubber and plastic molding presses and on blowout preventers, they have performed without maintenance longer than any other type of valve.

6000 P.S.I. Dual Pressure Standard Porting

THIS LONG, MAINTENANCE-FREE SERVICE

is possible because the metal-to-metal sealing surfaces are self-aligning and actually improve with use through continued lapping action. Sealing qualities do not diminish because a spring compensates for the wear.

DIRT CANNOT SCORE SEALS

because flow is through "Shear-Seals," sealing surfaces remain in constant intimate contact.

COMPLETE CONTROL OF YOUR CIRCUIT

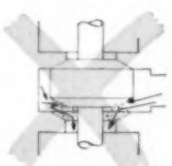
because "Shear-Seal" design is excellent for throttling. It permits opening to any desired degree of flow – smooth action without fighting fluid pressure.

The "Shear-Seal" action eliminates line surges and the round tubular flow passages provide more flow and velocity capacity (up to 60 ft. per sec.) because they are unobstructed by spools or poppets.

This is why we don't use

SPOOL OR POPPET DESIGN

POPPETS SCORE



SPOOLS LEAK

3000 P.S.I. Shut-Off

10,000 P.S.I. Shut-Off

"Shear-Seal"

Write for Catalog 58-59

barksdale valves CONTROL VALVE DIVISION

5125 ALCOA AVENUE • LOS ANGELES 58, CALIFORNIA

CIRCLE 12 ON READER SERVICE CARD

Applied Hydraulics FOR AUGUST:

How to Design for Fluid Maintenance

HERE'S THE LINE-UP OF ARTICLES FOR THE AUGUST ISSUE.

SURVEY

- Machine designers tell what they need to keep air and hydraulic circuits clean
- Design Guide to filters and conditioners for hydraulic and pneumatic circuits . . . construction, features, sizes, sources

FLUIDS

- Oil Storage and Handling
- Oil Additives Are Effective for Clean Systems
- Put Oil into Air Circuits
- Get Air out of Oil Circuits
- Design Reservoirs to Trap Dirt

AVIATION

- Handling High Temperature Hydraulic Fluids
- Selection of Aircraft Filters

The August issue of APPLIED HYDRAULICS will be a manual on fluid conditioning in hydraulics and pneumatics. Designers and users will find what components are available, and what techniques can be applied to keep air and oil in top operating condition.

Closing Date for August Issue:
• JULY 5th •

THIS MEANS EXTRA SALES IMPACT FOR MANUFACTURERS OF:

- HYDRAULIC FILTERS
- OIL CONDITIONERS AND RECLAIMERS
- AIR FILTERS
- AIR-LINE LUBRICATORS
- HEAT EXCHANGERS
- FLUIDS

FC FRANCHISE CIRCULATION — *Franchise Circulation gets magazines to the men who buy*

DW DISTILLED WRITING — *Distilled Writing gets magazines read*

Applied Hydraulics

The Magazine of Fluid Power

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE
812 Huron Road • Cleveland 15, Ohio • SUperior 1-9622

NEW YORK 17
Room 836,
60 E. 42nd St.
Tel. MUrray Hill 7-3420

CHICAGO 11
Room 704,
520 N. Michigan Ave.
Tel. WHitehall 3-1655

LOS ANGELES 57
Room 8,
672 S. Lafayette Park Pl.
Tel. DUnkirk 7-5104

LONDON, ENGLAND
John A. Lankester,
31 Palace St.
Westminster, S. W. 1